



..Journal..

OF THE

**West Australian
Natural History Society**

WITH WHICH IS INCORPORATED


The Mueller Botanic Society.

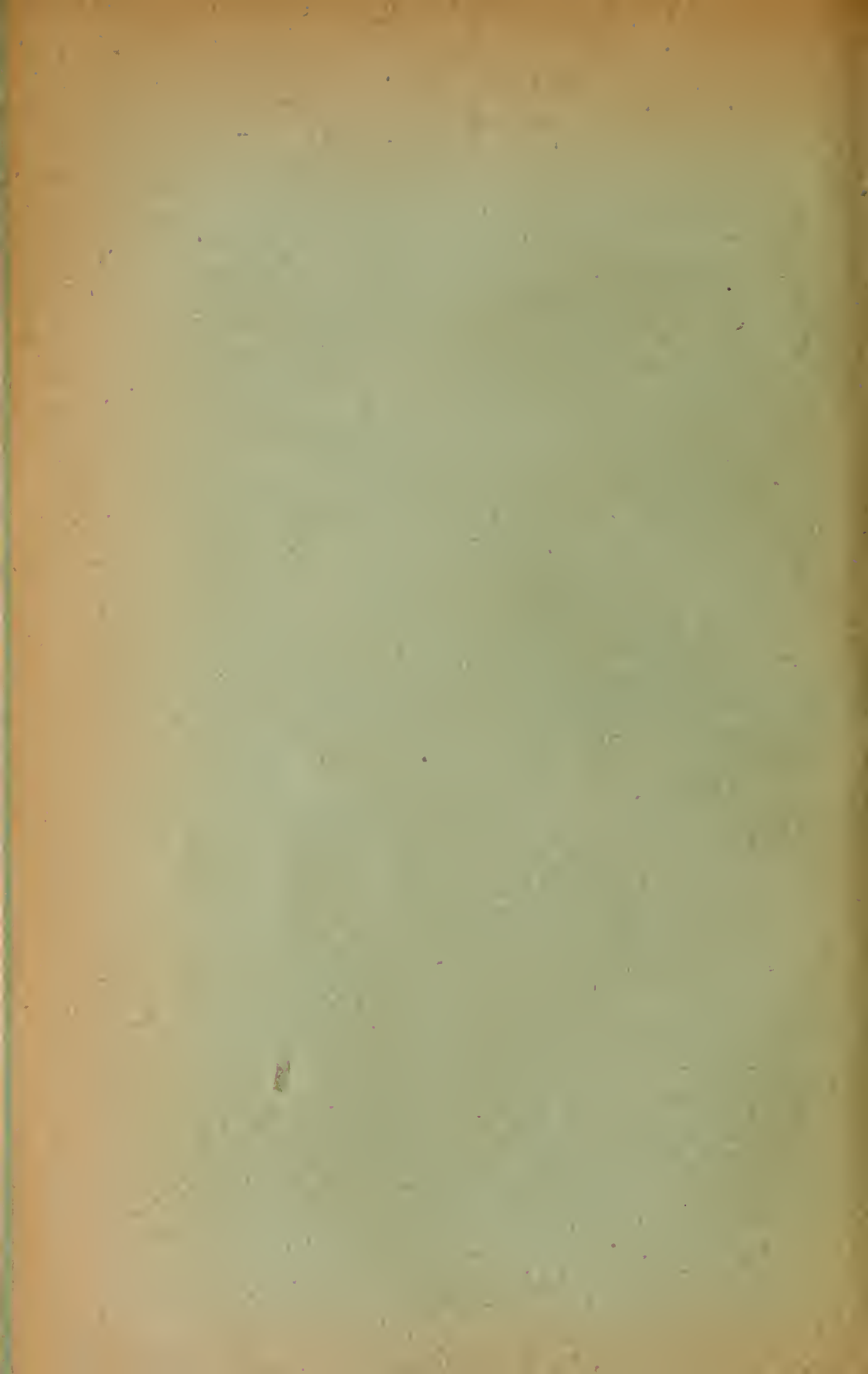
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MACROPUS ROBUSTUS WOODWARDI (Thos.)

Woodward's Wallaroo.

Grant Range, West Kimberley. Discovered by J. T. Tunney in 1901.

NATIONAL MUSEUM OF NATURE

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Annual Report 1904.

Ladies and Gentlemen,

The past year has been one in which much good work has been done by our Society. It was thought advisable to increase our usefulness by enlarging the scope of our work by including other branches of Natural History in addition to Botany. For this purpose the name was altered to "The West Australian Natural History Society," with which is incorporated "The Mueller Botanic Society." By this move we gained a large number of Scientific Members, by whose work and co-operation we shall become a useful and influential scientific Society. We are in communication with kindred Societies in Europe, America, and Australasia, to whom we send our Journals, receiving their own in exchange. The Journals, which constitute our chief expense, are issued as we have material to fill them. This year only one has been issued, but this is an exceedingly good one, and will be a proof to all who wish to know, that we are doing sound scientific work. The Government grant of £75 has been continued, subscriptions have been coming in freely, and our financial position, as you will see by the balance-sheet, is a good one. The retiring officers have maintained their interest, and their attendance at Council Meetings has been exemplary.

FRANK TRATMAN, President.

Recent Discoveries regarding the Fauna of Western Australia.

By BERNARD H. WOODWARD, F.G.S., C.M.Z.S., etc., Director of
the Western Australian Museum.

At the Meeting of the Western Australian Natural History Society, on Tuesday, the 7th March, 1905, I showed specimens and said a few words about some of the recently discovered new mammals, and referred to the increase in our knowledge of some of those previously known, however, for the Journal, I think it will be better to quote more fully the original descriptions of these, which appeared in the Proceedings of the Zoological Society of London, in "Novitates Zoologicae," and other Journals, as I consider it to be a matter of great importance to have descriptions of our Fauna published locally, and I trust that in future this Journal will be recognised as the proper medium for the notification of new species, as well in the Fauna as in the Flora of Western Australia.

Of the greatest importance are Mr. Thomas' remarks on the Kangaroos popularly called "Wallaroos," of which hitherto only two were known—*Macropus robustus* and *M. erubescens*. It will be noticed that for the new species he has adopted the trinomial plan, calling them all *Macropus robustus* with a third name added to show that they are very closely allied and all belong to one *Macropine* group.

In the birds Dr. Hartert has adopted the same plan, for instance in the "Bush Larks"—*Mirafrja javanica* has its nearest allies named *M. j. horsfeldi*, *M. j. secunda*, and so on; although in one way this system is rather cumbersome, yet in genera containing numerous species, it is a great convenience to have them arranged in groups.

The descriptions of the birds were compiled by Mr. C. P. Conigrave, who read the notes on them and showed the specimens at the meeting on 7th March.

ON SOME KANGAROOS AND BANDICOOTS FROM BARROW ISLAND, N.W. AUS- TRALIA & ADJOINING MAINLAND.

By OLDFIELD THOMAS, (*Novitates Zoologicae*, Vol. VIII., 1901).

In connection with the determination of some Kangaroos from North-Western Australia sent home some time ago by Mr. B. H. Woodward of the W.A. Museum, a question arose as to the characters of the Kangaroo described by Gould as *Macropus isabellinus*, on an imperfect skin from Barrow Island, off the north western coast of Australia. That skin, preserved in the British Museum, had remained unique up to the present time, and therefore Mr. Woodward, with great enterprise, got up, last year, an expedition to Barrow Island in order to obtain topotypes of this little-known animal. His collector, Mr. Tunney, was successful in obtaining a number of specimens, besides examples of *Lagorchestes conspicillatus* (Gould), and of the Bandicoot described below. A series of these species has been generously given to the National Museum by the authorities of the W.A. Museum.

The head is without any of the characteristic markings of *M. rufus*, and the skull shows all the structural characters of *M. robustus*, but is much smaller, as might have been expected from the insular habitat of the animal. It is also noticeably stouter and more heavily built. The hind feet are remarkably short, measuring only 250 mm. in an old male. The tips of the ears behind are brown or blackish, those of all the related continental forms being reddish or sandy, like the rest of the head.

Further details on this subject are to be found in a paper which Mr. Waite has recently written on a specimen in the Sydney Museum, collected by Mr. Tunney, and also received from the W.A. Museum.

The more accurate knowledge now, therefore, available about *M. isabellinus* enables me to give an opinion about some other N.W. Australian Kangaroos received previously from Mr. Woodward.

These are—firstly, a set of four, two males and two females, from Yalgoo, Murchison District, Western Australia. The females are the specimens on which my *Macropus robustus cervinus* was founded, the males, owing to an error in labelling, having been thought to be *M. rufus*, of which specimens were sent home at the same time. For these males the name *cervinus* is, unfortunately, not very suitable, as they are of a deep rich rufous, similar to, but richer than the ground color of *M. isabellinus*. The head is of the same color as the back,

not markedly greyer, as it is in the female; but the muzzle is inconspicuously browner. The hairs of the ears are rufous, like those of the crown. In all, males and females, the fur of the nape and fore-back slopes evenly backwards, there being no trace of a whorl in the region of the withers. This is only the case in *M. isabellinus*. The skull of the male, like that of the female, closely agrees with that of the true *M. robustus*.

A second set of four, two males and two females, obtained like the previous ones through the kind agency of Mr. Woodward, are from the Grant Range, in the Kimberley District, North-West Australia. These specimens, which could not be distinguished from *M. isabellinus* until proper material of the latter form was available, I now think to represent another distinct sub-species of the *robustus* group, and I have ventured to name it in honor of Mr. Woodward, to whose assistance the British Museum owes the whole of the material referred to in the present paper.

MACROPUS ROBUSTUS WOODWARDI, sp nov.—

Fur shorter, thinner and harsher than in *cervinus*. Fur of nape and fore-back more or less reversed forwards from a dividing whorl situated on the withers.

Male.—Bright rufous, nearly matching that of *M. isabellinus* above throughout, the head, ears and back being all of this color, as are also the middle line of the tail proximally, and the outer side of the limbs, Digits indistinctly blackish. Remainder of limbs and tail and under side of body dull whitish.

Female.—In general color more or less fawn; otherwise similar to male. One of the two species is of a pale sandy fawn, the other a deep fawn like the female of *cervinus*; the former appears to be in summer, and the latter in Autumn or Winter pelage.

Habitat.—Grant Range, S.W. part of Kimberley District, North-Western Australia.

Type.—Old male, B.M. No. 0611; *Co-Type*.—No. 085—W.A.M. Collected by J. T. Tunney.

The whole of these red forms of the *Macropus robustus* group were unknown when the catalogue of *Marsupials* was published, so that the imperfect type skin of *M. isabellinus* was not unnaturally considered to be related to *M. rufus*, but there is now no doubt that it is a stunted insular form of the same group. To Mr. Woodward alone is due the credit of this very considerable increase in our knowledge of the Western *Macropodidæ*; the verification of the occurrence of *M. rufus* in Western Australia, the discovery of both *M. robustus cervinus* and

woodwardi, and the more accurate knowledge of *M. isabellinus*, are all due to Mr. Woodward.

Still further north-eastwards from the range of the present animal, in the Northern Territory of South Australia, occurs *M. antilopinus* (Gould), which is of a somewhat similar color and general appearance, but differs markedly by the peculiar inflation of the sides of the muzzle. The hair of its nape slopes uniformly backwards.

MACROPUS ROBUSTUS ALLIGATORIS, sub-sp., nov.—

Type.—No. 1445. July 2nd, 1903. South Alligator River.

“Chackaru” of Natives. Iris-brown. J. T. Tunney.

Fur nearly as short and close as in *M. r. woodwardi*, much shorter than in the other sub-species.

N.B.—This species does not occur in W.A., but is included in this list as it is so near a neighbour and belongs to the group described above.

PRELIMINARY DIAGNOSIS OF A NEW GENUS AND SPECIES OF KANGAROO.

By the HON. WALTER ROTHSCILD, M.P., Ph. D., &c.

NOVITATES ZOOLOGICÆ, 1903, VOL. x., pp. 414 and 543; 1904,
VOL. xi., pp. 225.

DENDRODORCOPSIS, sp. nov.—

This genus is closely allied to both *Dorcopsis* and *Dendrolagus*, and in many respects stands intermediate. It differs from both in its much more hairy rhinarium and very short claw to middle toe of hind foot, which is concealed by the hair of the foot above, and only exceeds the pad of the toe in length by 6 millimeters. The naked pad of hind foot large, strongly rugose and extending up the back of hind legs as in *Dendrolagus*. Hind leg much longer than fore leg, as in *Dorcopsis*. Tail considerably shorter than body, covered with short, flat, and straight hair as in *Macropus*. Mr. Oldfield Thomas has examined the skull of this curious new kangaroo, and finds that its essential generic characters (especially the absence of the canine teeth) do not differ from those of true *Macropus*. This makes the genus much more interesting, as the external generic characters show almost conclusively that it is aboreal as well as rock-hunting in its habits, which fact would account for its modified outward resemblance to the Philanders and Tree-Kangaroos, while it nevertheless retains the essential macropine cranial characters.

DENDRODORCOPSIS WOODWARDI, spec. nov.—

Size larger than *Dendrolagus bennetti*, ears long and very hairy. Color above and below sooty brownish black, fore legs and lower half of hind limbs and tail deep black. Total length, 1,530 mm.; tail, 700 mm.; head and body, 830 mm.; hind foot, 250 mm.; ear, 80 mm. *Macropus bernardus* Rothsch. (see below). Difficult to procure.

Habitat.—Granite Ranges, head of South Alligator River.

Type.—No. 170-1046, 17, V. 1903; *Co-Types*, Nos. 6720 and 6721 W.A. Museum.—Collected by J. T. Tunney.

NOTE ON MACROPUS BERNARDUS (DENDRO- DORCOPSIS WOODWARDI).

By the HON. WALTER ROTHSCILD, M.P., Ph. D., &c.

When I published (antea, p. 414) a preliminary description of the above very distinct Kangaroo, I stated that the cranial characters were identical with *Macropus*. Mr. Oldfield Thomas, when writing a paper on the collection made by Mr. Tunney on the Alligator River, has pointed out to me that my new genus cannot stand, as even the external characters are more *Macropine* than I at first thought. I therefore, as there is already a *Macropus woodwardi*, propose for this new species the name of *Macropus bernardus*, instead of *Dendrodorcopsis woodwardi*.

The skull is very like that of *M. robustus*; it is, however, more lightly built.

It is, however, none the less a most striking and remarkable discovery, the finest that has been made in Australia for many years, and the organisers of Mr. Tunney's expedition are to be congratulated on so valuable a result.

PETROGALE ROTHSCILDI, spec. nov.—

Size about as in *P. lateralis*. Fur rather shorter and thinner in that species. Fur of nape reversed forward from withers; general color of back dull vinaceous brown ("Mars brown") lightening to brownish white (near "ecru drab") on the nape.

Habitat.—Cossack River, north of Western Australia.

Type.—Female, No. 157.—Collected July 23rd, 1901, by J. T. Tunney.

I have named this fine and distinct Rock Wallaby in honor of the Hon. Walter Rothschild, by whom Mr. Tunney's collecting expedition has been mainly supported, and whose scientific interest in the *Macropodidæ* is well known.

P. rothschildi is most nearly related to *P. lateralis*, but is readily distinguishable by its dark head and uniformly dark ears, the absence of either nuchal dark stripe or whitish flank patch, and by its shorter thinner fur.

Oldfield Thomas (Nov. Zool. Vol. XI, pp. 335, 1904).

PERAMELES BARROWENSIS, sp. nov. (Thos.)—

A small insular representative of the continental *P. obesula*. Size markedly smaller than in *P. obesula*. General color, strongly lined black and buffy, the individual hairs grey, basally darkening to black, which latter may either continue to the tip or replaced by buffy; woolly under fur, grey basally, whiter terminally. Head like back, or slightly darker; upper lip whitish; no darker markings round eyes. Ears short, rounded, closely covered with fine, buffy hairs. Under-surface dull whitish, not sharply defined, the hairs whitish to their roots. Arms externally like the body, darkening to brown on the metacarpals; the digits white. Hind limbs similar, but the digits also brown. Tail of medium length, grizzled brown above, whitish below. Skull, although conspicuously smaller, agreeing in all details with that of *P. obesula*.

Type.—Male, B.M., No. 1528; original number, 3290.—Collected 6th November, 1900, by Mr. J. T. Tunney.

DESCRIPTION OF A NEW PHASCOGALE FROM NORTH WESTERN AUSTRALIA.

By EDGAR R. WAITE, F.L.S., Zoologist to the Australian Museum.

RECORDS OF AUSTRALIAN MUSEUM, VOL. V., PT. II., 1904.

TYPE 5372 AND 5373 W.A. MUSEUM.

PHASCOGALE BLYTHI (Waite)—

In January, 1902, Mr. A. C. Blyth, of this city, invited me to see three small mammals which he had just brought alive from the Pilbarra District, North Western Australia.

I found them to be an adult pair and a half-grown example of a species of *Phascogale*. Mr. Blyth told me that on passing through Western Australia he had also left two examples with the Director of the Western Australian Museum and Art Gallery. In April, Mr.

Blyth kindly placed his animals in my charge for observation, but as I was at that time unable to give them the necessary study, they were returned, to await a more favorable opportunity. This proved a disastrous proceeding, for within a week the animals escaped and were not again seen.

Two months later, Mr. B. H. Woodward, Director of the Western Australian Museum and Art Gallery, asked me to examine the examples which he still had alive.

During the two or three days I had Mr. Blyth's animals in my possession, I found them to be very tolerant of the hand, having been accustomed thereto by their owner, though he told me that at first he had received some sharp bites from them.

I several times liberated them in a closed room, but by approaching gently had small difficulty in securing them again. When startled, say by clapping the hands, they would make a spasmodic spring of two feet or more.

In response to any inquiries regarding the behaviour of the animals in captivity, Mr. Woodward writes:—"The only habits I noticed were the wonderful quickness and skill in catching beetles, of which they were very fond. They always avoided the light as much as possible."

CERCHNEIS UNICOLOR (Milligan) Western Kestrel—

TYPE—Male, No. 6667 IN W.A. MUSEUM.—YALGOO.

This bird was captured alive at Yalgoo, in the north-western portion of this State (where it is said to be a very common form) and sent to the Zoological Gardens, South Perth. The Director, Mr. Ernest Le Souef, and the head-keeper of the Gardens, Mr. Giles, were, on its arrival at the Gardens, at once struck with its diminutive form and general rufous coloration as compared with living forms of *Cerchneis cenchroides* (Vig. and Hors.) which they had in the Gardens. On its death it was sent to the Museum and examined by Mr. Milligan, who stated that the new bird differs from the common form in not possessing any white or pale feathers on the under parts of the body, those parts being a decided cinnamon pink, and thus very distinctive. In addition, the tail is not grey, but rusty-cinnamon, and the legs pea-green and not orange yellow. The bird also is much smaller.

MALURUS EDOUARDI (Camp.) Black and White Wren—

Type.—No. 3326; *Co Types*, Nos. 3227, 3228 in Western Australian Museum, Perth.—Barrow Island, N.W. Australia.—Collector, John T. Tunney. January, 1901.

“Victorian Naturalist,” April 4th, 1901, Vol. XVII., No. 12, page 203.

The discovery of a black and white *Malurus* in Australia was of considerable interest to Ornithologists. The only other pied species of this genus, *M. albiscapulatus*, is found in New Guinea, from which the Australian species differs in having the upper wing coverts and inner secondaries, in addition to the scapulars, white.

For the new bird, Mr. A. J. Campbell proposed the name *Malurus edouardi*, in honor of His Majesty King Edward VII., this being the first Australian bird discovered during his reign.

This new wren was discovered by the collector of the Western Australian Museum, Mr. John Tunney, amongst spinifex on Barrow Island, off the north-western coast of Australia, in December, 1900.

Only three specimens were obtained, and they are all male birds, in various stages of plumage. Mr. Campbell predicts that the female, judging by analogy, will doubtless be brownish; paler on the underneath part, and owing to its environments will probably be more rusty colored than the females of the other members of its genus.

MALURUS PULCHERRIMUS (Gould)—

TYPE IN BRITISH MUSEUM.

The “Blue-breasted Wren,” *Malurus pulcherrimus*, although not new, is worthy of mention because from the time when it was discovered by Gilbert, the collector, in the Woongan Hills in 1842 (see Gould’s figures in his “Birds of Australia”), not another specimen was obtained until Messrs. A. W. Milligan and C. P. Conigrave, in the month of October, 1902 (after a lapse of 60 years), during a scientific expedition to the Stirling Ranges in the South, secured five specimens, and in the following year they obtained 13 skins in the Woongan Hills, the site of the original discovery.

SPHENURA LITORALIS (Milligan)—

Lesser Rufous Bristle Bird.—Cape Mentelle, S.W. Australia.
October, 1901. Collector, Mr. A. W. Milligan.

“The Emu,” January, 1902, Vol. I., part II., page 17.

Type.—Female, No. 4355 in Western Australian Museum, Perth.

The discovery of a new species of *Sphenura* was made by Mr. Milligan on the 12th of October, 1902, in the dwarf coastal shrubs at Ellensbrook, in the south-western division of this State, about midway between Cape Naturaliste and Cape Leeuwin, whither he had gone in the hope of obtaining specimens of *Atrichornis clamosa*.

The new bird resembles *Sphenura broadbenti*, and at first sight was thought to be that form, or a western variety of it, but after examination of a skin of the eastern form belonging to the Geelong Museum, kindly lent by Mr. W. Mulder, Mr. Milligan had not the slightest hesitation in differentiating it from that species.

The chief differences are that the new species is much smaller than *S. broadbenti*, that in the former the rufous or chestnut head is brighter, and the under surfaces lighter than in the latter, and that the yellow gape and triangular loreal spot present in *S. broadbenti* are absent in *S. litoralis*.

The bird has two distinct calls, viz., an alarm note it utters when closely pursued and pressed, resembling the words “pink, pink, pink,” and a song consisting of a series of clear, liquid, thrush-like notes.

The bird is very shy, is very seldom to be seen, and most difficult to flush. On the fourth day Mr. Milligan saw one running at top speed across one of those rounded sand hills (which abound on the coasts), with its tail depressed below the plane of the body, and its dwarf rounded wings used as an aid to its running, its toes just touching the ground, and its neck stretched to the utmost, when the bird reminded him very much of the action of the Lyre Bird in similar circumstances.

The food of the bird, as revealed by dissection, consisted wholly of land snails, which are found in abundance on the coastal limestone hills.

AMYTORNIS HOUSEI (Milligan), Black Grass-Wren.

Kimberley. Collector—Dr. F. M. House

“Appendix E to Report on Kimberley Exploring Expedition,” page 8.

Types.—(Nos. 4766 and 4768—Male and Female. Co-type—4767 Male) in W.A. Museum, Perth.

This handsome bird was discovered by Dr. F. M. House, Medical Officer and Naturalist of the exploring expedition that visited Kimberley in 1901, and in his honor it was named by Mr. Milligan.

The predominating hues of the plumage are black and deep chestnut, relieved on the head, neck, throat and chest with regular silky white longitudinal striations.

The new bird affords another instance of what is known as “protective coloring,” as its habitat is amongst the piled up masses of red and black sandstone found in the region traversed by the expedition, and with these colored rocks the plumage of the bird harmonises so perfectly that the birds are quite indistinguishable while motionless.

AMYTORNIS GIGANTURA (Milligan), Western Grass-Wren.

Mount Magnet, Murchison, Nov., 1899.—Collector, John T. Tunney.

“Victorian Naturalist,” May 7th, 1901, Vol. XVIII, No. 1.

Type.—(No. 1529) in W.A. Museum, Perth.

ACANTHIZA PALLIDA (Milligan), Pallid Tit.—

Wurarga, Yalgoo goldfield, Murchison, September, 1903.—Collector, F. Lawson.

“The Emu,” Vol. III, 1903, page 111.

A new *Acanthiza* was secured by Mr. Fred. Lawson at Wurarga, Yalgoo Goldfields, in September, 1903. Wurarga is about 100 miles inland from the western coast, well beyond the confines of the characteristic rain belt and in about the same latitude as the boundary line between Queensland and New South Wales. The new species is closely allied to *Acanthiza chrysorrhoa*, and bears affinity in the same degree to that species as *A. tenuirostris* does to *A. reguloides*. It is in fact, a pallid and miniature form of *A. chrysorrhoa*. Mr. Milligan did not declare it to be the Western form of the latter species, as our coastal form in temperate districts much resembles the Eastern one, but rather regarded it as the Northern and interior one.

ACANTHIZA ROBUSTIROSTRIS (Milligan), "Thick-billed Tit."

Woongan Hills.—Collector, A. W. Milligan.

"The Emu," vol. III, July 1903, page 71.

Types.—(5546 and 5548) in Western Australian Museum, Perth.

Acanthiza robustirostris belongs to that section of the genus in which the dark tail band occupies nearly the terminal half of the feather, and the base of the tail is bright colored like the rump and upper tail coverts. It was discovered in May, 1903, at Day Dawn, Murchison, by Mr. Frederick Lawson. The bill is remarkably robust for an *Acanthiza*. The general color of the upper surface is much more sombre than usual with this genus. The "scaling" or shell-marked feathers of the forehead, present in many members of the genus, are absent in this one. Above the rump is a conspicuous patch of white silky feathers, and the rump and upper tail coverts are snuff-colored, as also is the basal half of the tail. The sub-ocular and auricular regions are evenly and regularly "rippled."

MEGALURUS STRIATUS (Milligan), **Striated Grass-bird.**—

Lake Yanchep, 35 miles north of Perth; Dec., 1902.—Collector, A. W. Milligan.

"The Emu," April, 1903, Vol. II, part 4, page 201.

Type.—(5278) Male, in Western Australian Museum, Perth.

The type specimen was shot at Lake Yanchep, 35 miles north of Perth, by Mr. A. W. Milligan, in December 1902. It was compared with specimens of *Megalurus gramineus* from Victoria and Mandurah Estuary, some 40 miles south of Perth. Little difference exists between the Victorian and Mandurah skins. On the other hand, the difference between those skins and the Lake Yanchep skin is most marked. The latter is very much smaller and in addition, lacks the fulvous color of the upper surface, sides, flanks, and tail coverts of the former, and in lieu, has these of a dullish, lustreless smoky-brown.

The notes of the new bird are two melancholy ones, resembling in sound the syllables "tee tee." In the protected area of the Swan River, in Perth, the local bird has three notes—"titty tee tee." The birds were numerous, but difficult to flush owing to their secretive habits.

CALAMANTHUS MONTANELLUS (Milligan) **Rock Field-Wren—**

Type.—No. 5340, Male. Type 5341, Female, in Western Australian Museum, Perth.

Stirling Ranges. Collector, C. P. Conigrave.

“The Emu,” April 1903, page 200.

The new bird was found in the sterile stony tracts on the north or sheltered side on the Stirling Ranges. Its song is a series of musical warbling notes, which it utters either on the ground or in low bush. It runs along the ground like a mouse, and is very difficult to flush. The birds were very numerous in the sterile places indicated, but very difficult to secure.

XEROPHILA CASTANEIVENTRIS (Milligan) **Chestnut-bellied Whiteface—**

Types.—5521 and 5524 Male and Female in Western Australian Museum.

Murchison District.

“The Emu,” Vol. III., July, 1903, page 70.

Obtained at Pindar, in the Murchison District, by Mr. J. T. Tunney, in 1902. A careful examination by Mr. A. W. Milligan disclosed that major differences existed between it and the already described species of the genus *Xerophila*.

It may be distinguished from (a) *X. leucopsis* by the presence of a thicker bill and of deep dull chestnut rump, flanks and sides, and a chestnut and white abdomen, and white chin, throat and chest, and by the absence of the faint subterminal cross bars on the breast; (b) from *X. pectoralis* principally by the absence of the chestnut-brown back and the well-defined pectoral band of cinnamon-brown and the chestnut and white flanks, which in the new species are almost uniform chestnut; and (c) from *X. nigricincta* by the absence of the narrow black pectoral band and the cinnamon back which distinguish that species. The new species appears to occupy an intermediate position between *X. pectoralis* and *X. nigricincta*.

The following field notes by Mr. Lawson regarding the new species are of interest:—“The cinnamon flanks are a consistent feature. The call note is musical, though rather plaintive. They love rocky places, and are ground feeders. They are fairly common and usually to be found in company with *Sericornis brunnea* and *Acanthiza pyrrhopygialis*.”

MELITHREPTUS LEUCOGENYS (Milligan) Western Brown-headed Honey-eater—

Types.—5301 and 5300 Male and Female, in Western Australian Museum, Perth.

Stirling Ranges. Collector, Mr. A. W. Milligan.

“The Emu,” Vol. II., page 160.

This bird was secured in the Stirling Ranges by Mr. A. W. Milligan in September, 1902. It resembled in some respects the Victorian bird, *M. brevirostris*, but on full examination there were found to be specific differences between them, which may be summarized as follows :—(a) The new bird is less robust generally, and the bill in particular is shorter and more slender ; (b) the bare spaces surrounding the eye are orange and bluish emerald ; (c) the blackish chin is distinctly marked, as also is the greyish breast ; (d) the cheeks are white ; and (e) the head is blackish brown.

PTILOTIS NOVÆ-NORCIÆ (Milligan), Western White-eared Honey-eater—

Type.—No. 6309, Male ; Co-Type, No. 6310, in Western Australian Museum, Perth.

Woongan Hills. Collector, Mr. A. W. Milligan.

“The Emu,” Vol. III. (1904) April, page 226.

One of the novelties obtained during an expedition to the Woongan Hills in October, 1903. At first sight Mr. Milligan pronounced it, but with reservation, to be *Ptilotis leucotis*, although it appeared to be much smaller and not so brightly colored as the Eastern form. On subsequent comparison, Mr. Milligan noted distinct modifications in structure and other disposition, and consequently he decided it was a new species.

MIRAFRA JAVANICA WOODWARDI (Milligan), Bush Lark—

Onslow, N.W. Australia. Collector, John T. Tunney.

“Victorian Naturalist,” May 7th, 1901, Vol. XVIII., No. I., page 25.

Type.—No. 3452 Male, in Western Australian Museum, Perth.

GYMNORHINA LONGIROSTRIS (Milligan), Long-billed Magpie.—

Ashburton River N.W. Australia.—Collector, Mr. John T. Tunney.

Type No. 3602 in Western Australian Museum, Perth.

During the course of a systematic examination of the bird skins in the Western Australian Museum, Perth, Mr. Milligan's attention was

attracted to five Magpie skins which had been obtained by the Museum Collector, Mr. J. T. Tunney, on the Cane and Ashburton Rivers, North-Western Australia, and which bore at first sight, a striking resemblance to *Gymnorhina tibicen* (Latham) of Eastern Australia, except for their conspicuously long and narrow bills.

A closer examination and comparisons with a pair of mounted specimens of *G. tibicen* in the Museum, and with recorded scientific descriptions of that species disclosed so many points of difference as to warrant the separation of the Western form, and therefore Mr. Milligan declared it a new species. His grounds for separation were briefly as follows:—(a) The Western bird is longer; (b) its bill is longer; (c) its tail is shorter; (d) its tarsi are shorter; and (e) the thigh feathers are not black, but wholly white for the upper portion, and noticeably so for the lower. In addition, the plumage generally does not present the striking and decided contrasts of glossy bluish-black and snowy white that mark the Eastern forms. Mr. Milligan assigned to the new species the scientific name of *Gymnorhina longirostris*, and the vernacular one of the Long-billed Magpie, but he was aware that in the latter respect he was appropriating the vernacular name given by Mr. A. J. Campbell to his *G. dorsalis*. However, as such a vernacular name is not the translated equivalent of his specific name (*dorsalis*), and as the vernacular "long-billed" is the leading characteristic of the new species, he asked Mr. Campbell to waive his prior right, and suggested substituting the vernacular name of the "Varied-back Magpie," which Mr. Milligan thought would better indicate one of the chief characteristics of the adult female and the young of both sexes of *G. dorsalis*.



Some New Species of West Australian Plants.

By W. V. FITZGERALD, F.S.Sc., Lond., F.R.H.S., Engl.

SAPINDACEÆ.

DODONÆA HACKETTIANA, Sp. nov.

A SPREADING shrub of 6-10 feet in height, and 12-15 feet across; branches and branchlets almost or quite terete; more or less invested with a white or brownish tomentum; the young shoots viscid. Leaves glabrous or slightly villous, lanceolate to linear-lanceolate, obtuse, much attenuated at the base, copiously gland-dotted, margins flat, entire or repand, mostly $1\frac{1}{2}$ - $1\frac{3}{4}$ inch long, the midrib alone evident. Flowers dicecious, greenish-yellow, few or many in terminal or axillary racemes, much shorter than the leaves. Pedicels slightly villous, viscid, almost filiform, 2-3 lines long. Male flowers: Sepals 3, rarely 4, ovate, obtuse, scantily tomentose and viscid without, villous within and on the margins, about $1\frac{1}{2}$ line long. Anthers 6, seldom 8, obtuse, about as long as the sepals. Female flowers: Sepals 3, ovate, obtuse, sparingly tomentose and rigid without, villous within and on the margins, about 1 line long. Ovary, 3 celled, on a short thick stipes, rigid and slightly villous; style thick, shortly trilobed, at least 3 lines long. Fruit with the wings rounded and continuous from the base to the style, the wings attaining a circumference of 4-5 lines, and a width of $1\frac{1}{2}$ -2 lines. Seeds about, 1 line, dull grey, minutely reticulate or rugose.

Locality.—King's Park, Perth, among limestone.—J. Sheath August 1904.

Remarks.—This new species is readily recognised from forms of *D. viscosa*, Linn. and *D. Attenuata*, A. Cgh., by the villous indumentum, the calyx of the male flower being mostly 3-partite, the stamens 6, rarely 7 or 8, the female flower constantly 3-merous and the style long. In aspect, the plant somewhat resembles forms of *Rhagodia Billardieri*, R. Br., with which it is associated, and to this may be ascribed its non-discovery until it came under the notice of Mr. Sheath, the Superintendent of King's Park.

The new plant is named out of compliment to Dr. J. W. Hackett, M.L.C., Chairman of the King's Park Board, a gentleman who takes an active interest in any subject having for its object the advancement of natural science.

LEGUMINOSÆ.

ACKSONIA MOLLISSIMA, sp. nov.—

An erect, dense, heavy looking shrub of 8-12 feet in height. The branches, branchlets, pedicels, and calyxes closely invested with short appressed silky hairs. Branches prominently angular or almost winged; Phyllodineous branchlets linear to linear-lanceolate, straight or falcate, almost pungent pointed, of rather soft texture in the specimens seen, simple, flat, $1-1\frac{1}{2}$ inch long, central nerve prominent. Flowers, solitary or in pairs near the base of the branchlets, or scattered singly along their edges, sometimes forming irregular terminal racemes through branchlet-suppression. Pedicels nearly as long as the calyx, with minute bracteoles below the middle. Calyx $3\frac{1}{4}$ -4 lines long, not angular in the bud, the segments persistent. Petals as long as the calyx, the standard and wings bright yellow; keel purple. Ovary distinctly stipitate, tomentose, 2-ovulate. Pod oblong, falcate, almost acute, somewhat turgid, tomentose, 5-6 lines long, on a stipes of about 1 line.

Locality.—Margaret River, on hills overlooking Ellensbrook Farm, $\frac{3}{4}$ miles from the coast, in sandy soil overlying limestone.—E. W. Hursthouse, March, 1904.

Remarks.—The ovary and pod of the new species are quite those of *J. horrida*, DeCandolle, but in other characters it more closely approximates *J. sericea*, Benth.; differing, besides in the ovary and pod, chiefly in the longer flat phyllodineous branchlets, and the pedicels and petals proportionately longer as to the calyx.

MYRTACEÆ.

MICROMYRTUS HURSTHOUSEI, sp. nov.—

An erect glabrous shrub, of about 2 feet in height, with slender twiggy branches. Leaves decussate, loosely imbricate on the short branchlets, ovate, obtuse, thick, concave, keeled, $\frac{3}{4}$ -1 line long. Flowers small, white, sessile, 1-3 together in the upper axils and forming ovate heads or spikes. Bracteoles persistent, linear to linear-spathulate, concave, membranous, ciliate, at least as long as the calyx-tube. Calyx-tube cylindrico-turbinate, 5 streaked, about $\frac{3}{4}$ line long; lobes short, orbicular, herbaceous, with membranous finely denticulate margins. Petals orbicular, $\frac{3}{4}$ line diameter. Stamens 5, opposite the petals; filaments short, filiform; anther cells globular, opening in terminal pores. Ovules 2. Style very short, glabrous; stigma minute. Fruiting-calyx of soft texture.

Locality.—Murchison District, in sandy soil.—E. W. Hursthouse, October, 1902.

Remarks.—This new plant differs from *M. Drummondii*, Benth., principally in the foliage, the flowers sessile and seldom solitary in the axils and in the conspicuous persistent bracteoles. From the other species having 5 stamens it is still further removed.

BEAUFORTIA ERIOCEPHALA, sp. nov.—

A low spreading shrub of about 18 inches high, the branchlets and leaves invested with woolly white spreading hairs, rarely quite glabrous. Leaves opposite, spreading or erect, linear to linear-lanceolate, obtuse, shortly petioled, concave, keeled, 3-nerved, 3-4 lines long. Bracts broadly ovate or almost orbicular-cordate, with 5-7 nerves, reticulate-veined, all shorter than the calyxes. Flowers rather small, in dense globular or ovoid white woolly heads, the axis soon growing out; rhachis woolly tomentose. Bracteoles subulate, black-pointed. Calyx woolly tomentose, the tube about one line long; lobes subulate, erect, glabrous within, about as long as the tube. Petals as long as the lobes, red, ovate-lanceolate, obtuse, keeled, the back and edges woolly tomentose. Stamens scarlet or reddish purple, 4-5 lines long, in bundles of 5; claw narrow, densely woolly-tomentose, as long as or shorter than the glabrous filaments. Anther cells orbicular. Ovary very short, with one perfect ovule in each cell; style long, filiform. Fruiting spikes ovoid, $\frac{1}{2}$ inch long.

Locality.—Moora, in ironstone gravel.—E. W. Hursthouse, October, 1903.

Remarks.—Before expansion, the flower-heads form an ovoid woolly mass, with the black points of the bracteoles and calyx segments protruding. The species is allied to *B. purpurea*, Lindley, but is easily distinguished by the woolly white hairs on the foliage and inflorescence; bracts all shorter than the calyx; petals not shorter than the calyx segments; the woolly-tomentose staminal claws, etc.

COMPOSITÆ.

BRACHYCOMIE CILIOCARPA, sp. nov.—

A glabrous annual, with erect or ascending often much branched stems of 4-6 inches high. Leaves pinnate, with few to many narrow linear segments. Flower heads rather large on long slender peduncles. Involucral bracts ovate, thin, with membranous slightly serrulated margins. Ray-florets (white?) with a limb of above $\frac{1}{2}$ inch in length. Disk-achenes much compressed, wingless, the edges ciliate with long white silky hairs, the faces quite smooth and glabrous. Ray-achenes turgid, obovate, laterally compressed, with a slightly raised line in the compression, which is ciliate with long white silky hairs, the faces of the

achene smooth and glabrous, each face with a raised median line. All achenes bearing a conspicuous pappus which blends with the marginal ciliae.

Locality.—Cue, January, 1903.—J. R. P. Andrews.

Remarks.—This new species very closely resembles *B. iberidifolia*, Benth., but in that plant the achenes of the disk are angular, those of the ray corky and differently shaped. Neither of the achenes develops a conspicuous pappus nor marginal ciliae.

ANGIANTHUS CONNATUS, sp. nov.—

An erect or ascending usually much-branched annual of 3-6 inches high; stems glabrous; flowering branches and heads invested with a white wool. Stem-leaves opposite, connate, linear, obtuse or shortly acute, $\frac{1}{2}$ - $\frac{3}{4}$ inch long. Clusters of flower-heads turbinate-obovoid, about 3 lines long. Floral leaves few, alternate, lanceolate, obtuse, tapering at the base, reticulate, 2-3 lines long, the inner ones terminating in scarious tips. Receptacle slightly branched, subtending bracts broadly spatulate, of firm texture, reticulate-veined without, shorter than the partial involucre and terminating in small scarious tips. Partial involucre shortly stipitate, 1-3, usually 2, within each subtending bract and consisting of 2 outer keeled and 3 inner flattened scarious bracts, all linear and with the tips often expanded into small membranous appendages. Florets solitary, 5-merous, scarcely thickened at the base. Pappus a ring of scarious scales, connate at the base and falling off with the corolla. Achene smooth, bearing near summit a quantity of long white wool.

Locality.—Minginew.—W. V. F., September, 1903.

Remarks.—This species appears to be correctly referable to *Angianthus*, but is without immediate ally. The wool on the achene occurs in *A. demissus*, Benth. In *Gnephosis arachnoides*, Turcz. often occur several partial involucre within one subtending bract.

GNEPHOSIS EXILIS, sp. nov.—

An annual with slender, erect, scantily-woolly stems, much branched from the base, mostly 4-6 inches high. Leaves linear to filiform under $\frac{3}{4}$ inch long. Clusters of flower-heads globular, about 3 lines diameter, the florets conspicuous, surrounded by a involucre of several rows of shining yellow, woolly-ciliate scarious bracts, much shorter than the partial involucre. Receptacle small, convex, glabrous, the bases of the floret-heads prominent. Partial involucre slightly compressed, bracts scarious, scantily woolly at the top, bearing small ovate pale yellow laminae, the subtending 1 and 2 outer ones narrow and keeled, the three inner ones broader and almost flat, all very deciduous.

Florets solitary, 5-merous. Pappus a ring of short bristles, dilated and connate at the base, and usually falling off with the corolla.

Locality.—Mingineu, September, 1903.—W. V. F.

Remarks.—Closely allied to *B. skirrophora*, Benth., differing in more slender habit, the not hirsute receptacle, in all the partial involucre bracts bearing laminae and in the pappus.

HELIPTERUM PACHYCHÆTUM, sp. nov.—

An annual more or less invested with crisped woolly hairs, with several slender, almost simple branches ascending from the base, all specimens under 6 inches high. Lower leaves lanceolate-oblong, almost opposite, $\frac{3}{4}$ -1½ inches long, upper linear, smaller and degenerating to small leafy bracts on the peduncles. Involucre hemispherical, $3\frac{1}{2}$ -4 lines diameter. Bracts in few series, ovate, with a firm lanceolate-ovate centre, tinged with purple and excepting a few of the outermost, all membranous-margined and terminating in deltoid-ovate hyaline laminae of not more than one line in length on the inner bracts. Florets 20-25, slightly hispid, all hermaphrodite, and, excepting 2-3 in each head, all fertile. Achenes compressed, comparatively broad, densely silky-villous. Pappus of 15-20 plumose bristles, all equal and longer than the floret, rigid, much thickened downwards and united at the base, forming a short tube.

Locality.—Jacup, 50 miles west of Phillips River, among grass in shade of trees, October, 1903.—C. R. P. Andrews.

Remarks.—This species has the habit and involucre of some forms of *H. hyalospermum*, F. v. M., with almost the achenes of *H. rubellum* Benth. In the shortly connate pappus bristles, it approaches *H. Troedelii*, F. v. M.

GOODENIACEÆ.

GOODENIA DECURSIVA, sp. nov.—

An erect shrub with stout branches and, excepting a little wool in the axils of the leaves, bracts, and bracteoles, quite glabrous, the lower portion of the branches covered with the persistent bases of the leaves. Leaves crowded in the upper portion of the branches, sessile, stem-clasping and shortly decurrent, ovate to ovate-lanceolate, obtuse, or hardly acute, distantly and irregularly toothed, rather firm, from 1 to 1½ inches long, the floral leaves gradually smaller, from narrow-ovate to broad-lanceolate and entire. Flower white or tinged with purple, in a narrow racemose-panicle, the flowers in the lower half 2-4 on short secondary peduncles, the upper portion of the inflorescence simply racemose, the whole 3-4 inches long; primary peduncle not much shorter, stout and quadrangular. Bracts narrow-ovate to lanceolate; bracteoles linear-subulate. Pedicels short.

Calyx lobes linear-subulate. Corolla glabrous without, more or less hirsute within, about 8 lines long, the lobes nearly equal and narrowly winged, with purple streaks at the base and in the throat, the adnate portion of the tube with an obscure saccate protuberance. Free portion of the ovary and the style invested with white spreading bristly hairs. Dissepiment reaching almost to the summit of the ovary, ovules numerous (16-20) in each cell, in 2 rows. Indusium scantily hirsute on the back, margin ciliate. Stigma rather large, divaricately bilobed. Young seeds with broad membranous margins.

Locality.—Sandy ground on the side of granite hill, Esperance, October, 1903.—C. R. P. Andrews.

Remarks.—The following comparison will serve to distinguish the new plant from its nearest congener:—

Section—	<i>Goodenia Scapigera</i> , R. Br.	<i>G. decursiva</i> , W. V. F.
<i>Monochila</i> .		
	Leaves from linear to ovate, petiolate or simply sessile.	Leaves ovate to ovate-lanceolate, amplexicaul and shortly decurrent.
	Secondary peduncles long, with several sometimes many flowers.	Secondary peduncles short, with 2-4 flowers.
	Bracts narrow-subulate.	Bracts narrow-ovate to lanceolate.
	Dissepiment of the ovary reaching slightly above the middle.	Dissepiment of the ovary reaching nearly to the summit.
	Indusium glabrous or scantily ciliate.	Indusium conspicuously ciliate.
	Seeds with thickened or scarcely membranous margins.	Seeds with broad membranous margins.

EPACRIDEÆ.

LECOPOGON DENTICULATUS, sp. nov.—

Shrubby and apparently erect, the branchlets scabrous or shortly pubescent and angular. Leaves all opposite and decussate, imbricate in 4 rows on the branchlets, distant on the branches, erect, ovate, obtuse, broadly sessile, concave, rather thick with denticulated margins, 1-1½ lines long, prominently keeled, with 2 conspicuous nerves on each side of the keel. Flowers few, in short terminal spikes. Bracts and bracteoles resembling the leaves, but smaller, apparently all opposite. Calyx herbaceous, about 1½ lines long, the sepals lanceolate, near the

summits keeled and terminating in callous apices, margins ciliate with short woolly hairs. Corolla white, hardly 2 lines long, the lobes slightly longer than the tube. Filaments adnate above the middle of the anthers, the latter dark-colored, ovate, with small white recurved sterile tips. Hypogynous disk of free ovate scales. Ovary glabrous, turbinate, slightly ribbed, 2-celled; style very short. Fruit slightly exceeding the calyx, obovate, longitudinally striate, 1-seeded by abortion.

Locality.—Near Albany, October, 1903.—C. R. P. Andrews.

Remarks.—Independently of carpological differences, this new species can be distinguished from its nearest ally as follows:—

Section— <i>Perojoa</i>	<i>L. oppositifolius</i> , Sond.	<i>L. denticulatus</i> , W. V. F.
Series— <i>Oppositifolia</i>	Leaves narrow to broad-linear, carinate, margins entire.	Leaves ovate, prominently striate, margins denticulate.
	Sepals colored, simply obtuse.	Sepals herbaceous, carinate and callous at the apices.
	Anthers with prominent sterile tips	Anthers with minute sterile tips.
	Hypogynous disk of connate scales.	Hypogynous disk of free scales.

LEUCOPOGON MINUTIFOLIUS, sp. nov.—

An undershrub with numerous slender erect stems arising from a thick stock, all under 1 foot in height, corymbosely branched above the middle, the branches pubescent. Leaves imbricate, ovate to ovate-lanceolate, very obtuse, concave, thick, $\frac{1}{2}$ – $\frac{3}{4}$ line long, strongly keeled, with several obscure parallel nerves. Flowers small, in headlike spikes. Bracts leaflike, slightly membranous-margined; bracteoles ovate orbicular, obtuse, ciliolate, concave, prominently keeled, not half as long as the calyx. Sepals lanceolate ovate, very obtuse, purplish, ciliolate, slightly above 1 line long. Corolla $2\frac{1}{2}$ lines long, the lobes much longer than the tube. Anthers rather broad, the filament attached immediately below the prominent recurved sterile tips. Hypogynous disk truncate. Ovary glabrous, 2-celled, slightly dilated at the summit, the style short and thick. Fruit cylindrical, slightly exceeding the calyx, truncate, 1-seeded, the style persistent.

Locality.—Sand plain East of Stirling Range, October 1903.—C. R. P. Andrews.

Remarks.—This pretty little species belongs to the section *Perojoa*, series *Concurvæ*, and does not appear to have any near ally among the species included in that section. The leaves are among the smallest in the genus.

LEUCOPOGON BREVISTYLIS, sp. nov.

A shrub with stout branches, invested with coarse white spreading hairs. Leaves alternate, mostly clustered beneath the inflorescence, erect, lanceolate to ovate-lanceolate, tapering into a callous point, margins serrulate, mostly $4-4\frac{1}{2}$ lines long, concave, scabrous and strongly striate. Flowers sessile, forming short headlike spikes, terminal and in the upper axils on short leafy branches. Bracts minute; bracteoles hyaline, cordate-ovate, obtuse, about $\frac{1}{3}$ as long as the calyx, keeled and scantily ciliolate. Sepals hyaline, ovate-lanceolate and somewhat cordate, obtuse, slightly above 1 line long, ciliolate. Corolla $2\frac{1}{2}$ lines long, the lobes longer than the tube. Anthers attached to the filaments immediately below the bases of the

LEUCOPOGON MINUTIFOLIUS, sp. nov.—

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strongly striate. Flowers sessile, forming short head-like spikes, terminal and in the upper axils on short leafy branches. Bracts minute; bracteoles hyaline, cordate-ovate, obtuse, about $\frac{1}{3}$ as long as the calyx, keeled and scantily ciliolate. Sepals hyaline, ovate-lanceolate and somewhat cordate, obtuse, slightly above 1-line long, ciliolate. Corolla 2½ lines long, the lobes longer than the tube. Anthers attached to the filaments, immediately below the bases of the conspicuous sterile tips. Hypogynous disk sinuate-dentate. Ovary glabrous, 2-celled, dilated at the summit and then abruptly tapering into the very short style.

Locality.—Murchison, October, 1902.—E. W. Hursthouse.

Remarks.—The new plant differs from *L. Gilbertii*, Stsch., in the presence of hairy vestiture, broader striate leaves, proportionately shorter cordiform hyaline bracteoles, broader sepals and in the ovary. From *M. gnaphalioides*, Stsch., it is principally removed by the differently shaped and proportionately shorter bracts and bracteoles and the very different sepals and ovary.

MYOPORINEÆ.

EREMOPHILA (Pholidia) Scaberula, sp. nov.—

A low growing, almost procumbent heath-like shrub, the branches with raised decurrent lines from each leaf-stalk and along with the foliage scaberulous and scarcely viscid. Leaves rather crowded, spreading or incurved, linear or almost subulate, obtuse, attenuated into a short petiole, entire, thick, flat above, the midrib prominent beneath, 2-4 lines long. Flowers purple, solitary, on thick axillary pedicels of 1-2 lines long. Calyx glabrous, about 2 lines long, the segments lanceolate-ovate and terminating in subulate recurved points. Corolla 5-6 lines long, tube not longer than the calyx, the obliquely broad campanulate portion longer; lobes broad and rather short, the upper ones connate high up and recurved, the lower middle one broader and longer than the others, quite glabrous without, slightly woolly within. Stamens included. Ovary glabrous, scarcely rugose, slightly laterally compressed, cylindrico-conical, 2-celled, each cell 2-ovulate. Style slender, glabrous, hooked at the end, exserted. Fruit narrow-ovate, not longer than the calyx, rugose and usually 4 celled.

Locality.—Moora, growing in clay or rich loam in flat country.—E. W. Hursthouse, October, 1903.

Remarks.—This new species approaches *Eremophila* (*Pholidia*) *microtheca*, F. v. M., differing principally in the branches and foliage being scaberulous, not plumose-pubescent; shape and arrangement of the leaves; calyx-segments glabrous, not plumose-pubescent, also in the shape of the corolla and less rugose fruits.

PROTEACEÆ.

GREVILLEA STENOPHYLLA, sp. nov.—

An erect bushy shrub of 6-8 feet in height; branchlets compressed and along with the young leaves sericeous, at length glabrous. Leaves linear-filiform, mucronate acute, often unciate, doubly grooved beneath by the thickened revolute margins and prominent midrib, slightly channelled above, simple or rarely bilobed, mostly about 3 inches long. Racemes rather dense, ovoid, under 1 inch long, on peduncles of 3-6 lines, several together forming short terminal panicles. Rhachis tomentose. Pedicels silky hairy $2-2\frac{1}{2}$ lines long. Perianth white, silky hairy without, almost glabrous within and with a ring of woolly hairs about the middle; tube not very narrow, slightly dilated below the middle, about $2\frac{1}{4}$ lines long, revolute under the globular limb. Torus straight; gland semi-annular, prominent. Ovary glabrous, on a stipes of $1\frac{1}{4}$ line long; style slender about 4 lines long, hardly thickened under the lateral orbicular stigmatic disk. Fruit not seen.

Locality.—Minginew, September, 1903.—W.V.F.

Remarks.—As regards its floral character, the new plant hardly differs from *G. commutata*, F. v. M., excepting in the slightly dilated perianth-tube, but the foliage is markedly dissimilar from that of any forms of the Murchison River species.

GREVILLEA BRACHYCLADA, sp. nov.—

A shrub with numerous short twiggy branches, glabrous or scantily hairy. Leaves not numerous, often clustered at the nodes and on short branches, entire, narrow-linear, obtuse, shortly petiolate, margins refracted, silvery silky on both sides, $\frac{3}{4}-1\frac{1}{4}$ in. long, the midrib conspicuous beneath, with 1-3 longitudinal nerves more or less evident above. Racemes terminal, on short slender silky hairy peduncles, umbel-like and consisting of few small flowers. Pedicels $1\frac{1}{2}-2$ lines long, silky hairy. Perianth pale-colored, invested with silky appressed hairs without, densely woolly within, especially below the middle, the tube very slender, under 3 lines long, recurved under the globular limb. Torus nearly straight; gland large for the flower, semi-annular. Ovary glabrous, conspicuously stipitate. Stigmatic cone short, with a prominent margin. Fruit obliquely ovate, about $3\frac{1}{2}$ lines long, smooth or slightly muricate.

Locality.—Greenough River, July, 1903.—C. R. P. Andrews.

Remarks.—When in fruit this species would be readily taken for a depauperated form of *G. Endlicheriana*, Meiss., but the perianth and style are very different. It does not appear to have any immediate ally.

EUPHORBIACEÆ.

BERTYA ANDREWSII, sp. nov.—

A shrub, very viscid, and excepting the flower and underside of the leaves, glabrous or slightly velutinous. Leaves scattered, narrow to broad-linear, obtuse, shortly petiolate, mostly 4-6 lines long, margins much refracted, slightly velutinous underneath. Inflorescence a small terminal leafy raceme consisting of 1 terminal female flower, and 2 or 3 males, axillary lower down, all on short thick pedicels, lengthening out to 2 lines when in fruit, and much dilated upwards. Bracteoles linear, persistent, shorter than the calyx segments, usually 2 only under the female flower, none under the males. Male flower: Calyx segments 4, broadly ovate, obtuse, $\frac{3}{4}$ -1 line long, but not seen fully expanded, puberulous within and on the margins, the base of the staminal column and itself invested with dense tufts of white silky hairs. Female flower: Calyx segments 5, ovate to lanceolar-ovate, obtuse, pink, puberulous on the margins, at least 2 lines long, enlarged under the fruit. Ovary surrounded at the base by a ring of white silky hairs, which extends $\frac{1}{3}$ of the way up, the remainder of the ovary glabrous; stigmas 3, fully $\frac{3}{4}$ line long, each cleft to $\frac{2}{3}$ of its length into 2 divisions, which are linear and simple, or broad and again shortly bi-or trilobed. Fruit globose, slightly verrucose, 3 lines diameter, very obtuse, obscurely 6-angled. Perfect seed, 1 only, narrow-ovate, brown and smooth without.

Locality.—Between Esperance and Norseman, October, 1903.—C. R. P. Andrews.

Remarks.—From the new species, its two West Australian congeners chiefly differ as follows:—

B. dimerostigma, F. v. M., in being quite glabrous and not conspicuously viscid, in the small acute pale-green leaves, sessile axillary flowers, female perianth segments much shorter and narrower, in the stigmas being constantly cleft to the base into 2 linear divisions and in the ovate pointed fruit. The male flowers of this species have not been described. It was discovered at Victoria Springs by Giles.

B. quadriseptala, F. v. M., differs from the new plant in having longer velutinous leaves, male flowers forming a terminal raceme, female solitary and almost constantly 4-merous, the margins of the segments conspicuously bearded, in the stigmas being 3-cleft, and in the broader spotted seed. The species was first discovered by Dempster, near Esperance, and at Fraser's Range.

The Salient Geological Features

OF

British New Guinea (Papua).

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INTRODUCTION—

"A glance at the map," writes a well-known traveller, "will show hovering as it were over Australia, a great island which in appearance resembles a bird. The portion to the north-west may be considered the head, McClure's Inlet the mouth, the rugged mountain ranges which separate Gleevink Bay from the Arafura Sea, the neck, the part extending to the south from the DeGroot River to the Papuan Gulf, and from the Amberno River to the Astrolabe Gulf on the north, the body, while the long tapering peninsula may be designated the tail. If in addition to this, we regard the islands of Talbot and Saibai as the feet, we shall then have an interesting specimen of a *rara avis*. This huge bird extends for a distance, in an oblique line from the extreme north-west to the extreme south-east, of 1,200 geographical miles, whilst its extreme breadth reaches 380 miles."† Small wonder, therefore, that the eyes of certain, farseeing Statesmen were longingly cast upon this gigantic bird, which in the possession of unsympathetic owners might be used for purposes not conducive to the well being and peace of mind of those residing in Australia.

†Explorations and Adventures in New Guinea.—Captain J. Strachan.

After years of anxious waiting, the whole of the south east portion of New Guinea was taken possession of by Sir Thos. McIlwraith in 1883, in the name of the Sovereign, but it was not until 1888 that British New Guinea was formally annexed to the Crown by Sir Wm. McGregor, a trusted official of the Colonial Office, and who for many years afterwards occupied the position of Administrator. Finally the territory passed into the possession of the Commonwealth of Australia towards the close of 1901.

It seemed to me that some account of the geology of British New Guinea might prove not uninteresting to the Society, the members of which, federation being now an accomplished fact, may claim as taxpayers to have a more than passing interest in our first Possession.

My own interest in New Guinea began twenty-five years ago, after reading D'Alberti's delightful work of travel, "New Guinea—What I did and What I saw;" but it was not until the year 1891 that I had the good fortune to set foot in the country, when the then Queensland Minister for Mines, the Hon. W. O. Hodgkinson, acceded to the request of Sir Wm. McGregor that I should be permitted to spend some months in the Possession.

During my visit unusual opportunities of examining into the geology of a considerable portion of the country were presented. The Government steamer, "Merrie England," was employed as a means of locomotion and a base of operations, as many instructive sections were best seen along the coast, these were examined by means of native canoes or boats, and when opportunity offered, traverses were made on foot for considerable distances inland. With very few exceptions, it was found that the coastal districts and many of the adjacent islands were occupied with a number of extinct volcanoes, deposits of lavas and ashes, and more particularly on the North-East coast and the Louisiade Archipelago, with a large area of nearly horizontally bedded coral limestones, in fact, upraised reef masses. A large portion of the backbone of the mainland is composed of ancient crystalline rocks, which, wherever exposed, were seen to be either vertical or inclined at very high angles. These "foundation stones" of New Guinea are continuous through the islands of the D'Entrecasteaux and Louisiade Group, which latter forms the extremity of that submarine ridge which trends in the direction of the north island of New Zealand.

New Guinea rests upon a submarine bank bounded by the 2,000-fathom line, which bank includes the islands of New Britain, the Solomon Group, Santa Cruz, New Hebrides and the Fiji Archipelago; these islands are connected by an arm stretching so far southward as to embrace the Tonga and Kermadoc Groups. This large submarine bank, which has been aptly termed the Melanesian

Plateau is separated from another upon which rest the islands of Norfolk, Lord Howe, New Zealand, Chatham, &c., by a deep abyss of over 2,000 fathoms, which heads in the Gulf of Papua. The course of the northern portion of this submarine valley agrees in its general trend with that of the Fly River, after its divergence to the eastward by the rocky islands of Torres Straits, which are merely the northern projection of the Peninsula of Cape York. In the centre of this valley, there appears a bank upon which rest New Caledonia and the Loyalty Islands. From Norfolk Island northwards, the plateau is connected with the Great Barrier Reef by numerous islets, reefs and quays, just appearing above the tidal mark, the summits, I take it, of a submerged range. What may be called the New Zealand fork of the Melanesian Plateau is separated from the Continent of Australia by another deep valley heading somewhere near Sandy Cape, on the Queensland Coast.

From these data we are enabled to trace an approximate parallelism between the mean trend of that arc which includes the Barrier Reef and the north-west island of New Zealand, and that which may be appropriately designated as the Papua-Fijian arc. A careful study of the deep-sea soundings reveals the presence of folds in the earth's crust of which the continents are merely such portions as are elevated above sea level; these continental masses have formed a nucleus around the old outlines, of which the principal changes in configuration have taken place. The broad problems raised by a study of what may be called this ancient geography, which has a fascination peculiarly its own, find in geology much of their final solution, hence the light thrown upon the evolution of this portion of the earth's surface by an account of the salient geological features of a part of one of the islands of the rim bounding the Australian Continent, may, perhaps, be of additional interest to those of the Society who find a little of their private pleasure in matters scientific.

PREVIOUS OBSERVATIONS.

As far back as the year 1844, Mr. J. Beete Jukes, the Naturalist to H.M.S. "Fly," visited, in the course of his travels, a portion of New Guinea at the head of the Papuan Gulf, but the absence of any mention of geological facts in the record of the journey is probably explained by the following passage by Mr. J. MacGillivray, summarising the results of the work of the "Fly":—

"This country presented a great sameness of aspect; low muddy shores covered at first with mangroves, and further back with dense forests, were found to be intersected by numerous channels of fresh water, the mouths, there is reason to suppose, of one or more large

rivers, of which the great extent of country is the Delta. Great mud banks, extending from ten to twenty miles out to sea, prevented approach except in boats."†

The geological pioneer of what is now British New Guinea was undoubtedly Mr. John Macgillivray, the Naturalist, who accompanied H.M.S. "Rattlesnake," on board of which Professor (then Mr.) Huxley was Assistant Surgeon, to New Guinea and the Louisiade Archipelago in the year 1846 to 1850. From the pen of this traveller, a man of true scientific insight, we have the first account of the geological features of a part of the coast line and some of the islands of the Louisiade Archipelago.

In 1877, the late Mr. C. S. Wilkinson, Government Geologist of New South Wales, described a collection of geological specimens collected by William Macleay from the coasts of New Guinea.‡ The collection contained oolitic limestone from Bramble Bay; yellow calcareous clay from the Katau River; and yellow and blue calcareous clay from Yule Island and Hall's Sound. The fossils, the large number of which were obtained from Hall's Sound, proved to be of Tertiary Age, and assumed to be on the horizon of the Lower Miocene of Australia.

In 1885 Dr. Haacke, the Geologist and Zoologist to the expedition fitted out by the Royal Geographical Society of Australasia, visited the Strickland River, an important tributary of the Fly, but so far as I have been able to learn, this observer does not appear to have published any account of the geology of the district travelled. The specimens collected by the party were entrusted to the late Mr. C. S. Wilkinson, Government Geologist of New South Wales, who in his report* mentioned that a number of travelled boulders were obtained from a spot called Observatory Bend, 75 miles above the confluence of the Strickland with the Fly River. Amongst the pebbles were "red and white marble limestone, altered slate with quartz veins (Silurian), brown jasperoid rock, quartz syenite, dense basalt, vesicular basalt, scoria and pebbles, indurated calcareous shells containing beautiful casts of *Ammonites*, and other fossils of Cretaceous Age." These fossils were submitted to Mr. R. Etheridge, Jun., who recognised among them "four, more or less, recognisable species, or at any rate species which

†J. Macgillivray. "Voyage of H.M.S. "Rattlesnake." London, 1852.
Vol. I., pp. 179.

‡Proc. Linn Soc., New South Wales, 1877, I., part 2, pp. 113.

*Trans. and Proc. Royal Geographical Society, Australasia, New South Wales.
Vol. III. and IV., pp. 203-206.

can be referred to one or other of the sections into which the old genus *Ammonites* is now broken up, and the facies of which is sufficiently clear for broad generalisation."†

In 1892, a series of petrographical notes upon some of the volcanic rocks from New Guinea, were contributed by the late Mr. A. W. Clarke, at one time Mineralogical Lecturer to the Queensland Government, to the Geology and Palaeontology of Queensland by Messrs. Jack and Etheridge; whilst the reports by the different members of the Geological Survey Staff of Queensland, on specimens submitted by the Administrator, have added a little further light upon the petrology and geology.

CORAL REEFS, CORAL ISLANDS, &c.

The coral formations of British New Guinea present features of unusual interest. The up-raised reef masses and the associated deposits took up the great portion of the time I was enabled to devote to this subject; these occupy a considerable portion of the north-east coast, the Louisiades, and some of the adjacent islands. All gradations from reefs only a few feet above the water up to 2,000 feet above the level of the sea were noticed.

The rocks, of which these up-raised reef masses are composed, present pretty much the same lithological characters throughout, viz., very hard and sonorous compact limestones, of a whitish color; some varieties, however, have a distinct yellow or reddish-brown hue. Coral fragments do not appear to be very common in the raised reefs; this scarcity need excite no surprise, for recent researches have shown that corals play but a subordinate part in the building up of coral reefs, and that calcareous *algæ*, *foraminifera* *echinodermata*, *polyzoa*, *lamellibranchiata*, and other organisms form by far the large portion of the rocks. Some of the up-raised reefs masses examined were found to contain numerous molluscan remains, but up to the present time, no opportunity of critically examining these fossils has presented itself.

It was found in the majority of instances that the limestone of the elevated reefs was seamed with veinlets of carbonate of lime; generally speaking, it was found that the coralline structure had been almost obliterated by the changes which the limestones had undergone since their formation. This alteration had not, however, proceeded throughout the whole thickness of the rock, for in one of the islands, Misima, the base of one of the up-raised reef masses was found to consist of a chalky limestone, in which the remains of corals still exist.

†Etheridge-Palaeontology of New Guinea, Records Geol. Sur. New South Wales. Vol. I., part 3, pp. 175.

In most of the islands and the localities examined, these elevated reef masses, when viewed at a distance, presented the appearance of vertical walls and almost horizontal terraces, stretching often for considerable horizontal distances. The faces of these cliffs are sometimes covered with vegetation to such an extent as to present the appearance of huge walls of foliage. The reefs raised only a few feet above the sea level, present along the shore white perpendicular cliffs of varying height, above which is an almost level tableland, very broken and rugged, and with a very uneven surface. Gigantic swallow holes and enormous caves have been carved out of some of the limestones, and are lined with stalagmites and stalactites; the faces of the limestone cliffs are weathered into most rugged and sharp-edged forms, and often present features of great beauty. The thickness of these reef masses I had no opportunity of ascertaining; it is, however, improbable from their mode of occurrence that their vertical thickness can be very great.

In the majority of cases which came under my notice, the various limestone terraces were horizontal, though at Ware (Teste Island), a marked and significant peculiarity of the reef limestones was their arrangement in a series of gentle folds, the axes of which trended roughly north and south. In the Island of Einauro (Cette Island), two miles distant from the mouth of Losoa Doudou (Millport Harbour), the cream colored limestones had a dip of 50 degrees to the west-north-west.

In a few cases only was the base of the up-raised reefs seen. At Ware (Teste Island) it rests upon a leaden-grey, slightly calcareous breccia, containing fragments of olivine. On the Island Misima (St. Aignan) an interesting section in one of the largest caves showed the base resting upon the up-turned edges of the crystalline schists, with the intervention of a small thickness of what appears to be a partially consolidated volcanic ash; in another portion of the island, the base rests directly upon the ancient schists.

From Losoa Doudou (Millport Harbour), I had an opportunity of paying a somewhat hurried visit to the Island of Einauro—Cette Island, of the Admiralty Charts—distant about two miles from the mouth of the bay. Viewed from a distance, this island presents to the east an almost vertical cliff of some considerable height, and of a "basaltic" appearance. On examination, however, the cliffs were found to be composed of a dense, sonorous, cream-colored limestone which showed no trace of coral origin to the eye. Occasionally the solid limestone was seamed with calcite or aragonite. The whole surface of Einauro was apparently of similar limestone. Einauro may be regarded as an elevated coral island.

In the isthmus dividing Tauwara (Milne Bay) from that of Pouro (Mullen's Harbour), another elevated reef mass resting upon andesitic lavas and agglomerates was noticed.

Leaving Samarai, Louisiade Archipelago (said to have been discovered in 1606 by Louis Vaez de Torres), our course was generally south-east. We passed between the Lebrun Islands and the Bell Rock, and anchored for a while off the north coast of Ware (Teste) Island. When approached from the north-west, Bell Rock, as its name implies, presents the appearance of a gigantic bell. The islet, the altitude of which according to the Admiralty Charts is 420 feet, rises abruptly from the water which varies from 16 to 30 fathoms in depth. The cliffs are perpendicular, and those on the north appeared to be absolutely inaccessible. Bell Rock is composed of a yellowish white brecciated limestone, dipping at a low angle to the north. This island is a raised coral reef. Clifty Island, adjoining, in reality a low elongated rock, was of a similar nature.

The north western end of the island of Ware shewed a long escarpment of a hard cream colored sonorous limestone, resting on a calcareous breccia, containing fragments of olivine, derived in all probability from the olivine-basalt which forms a portion of the island. Skirting the north coast, Ware (Teste Island) appeared to be of coral limestone also. A marked peculiarity was the disposal of the beds, when viewed as a whole, into a series of gentle folds, the axis of which trended roughly north and south.

Leaving this interesting island we anchored in the Bagavarina (Conflict) Group for the night, and on the following morning steamed slowly through the group, heading for the Pannaet (Deboyne) Islands. Eventually we dropped anchor in a channel between the reef (west of Panapompom) which encircles the Deboyne Group. Approaching the island from our anchorage, in a whale boat, we had to pull over a tract of very shallow water about a mile in width. A considerable portion of this shore platform appears to be laid bare at low water. The seaward face of the platform plunges down very rapidly into very deep water. The first feature that attracts the attention of a geologist on landing is a conspicuous, white, perpendicular cliff from 7 to 10 feet in height, continuous along the whole length of the beach. The cliff is composed of a white coral limestone, which weathers into curious cavernous forms. The limestone contains fragments of coral and shells; in one piece an unnameable brachiopod was collected. The summit of the cliff forms a low tableland of great extent, upon which natives have erected their gardens and homes. The rest of the island, the highest summit of which rises to 1500 feet above sea level, is made up of ancient crystalline schists. The neighbouring island of Panapompom, about 4 square miles in area, and having an altitude of 500 to 600 feet, I found to consist of dark basic crystalline schists, inclined at a low angle to the south-east.

Kimuta, a well grassed island, the largest of the Renards, was also found at Mguoa, on western end, to be formed by a raised coral reef. The reef is composed of a cream colored, fossiliferous limestone, seamed with veinlets of carbonate of lime.

The island of Misima (St. Aignan), which I visited after leaving the Renards, is perhaps one of the most interesting and instructive to the student of coral reefs. Misima is about 22 miles long and varying from 1 to 10 miles in breadth. The highest peak, Mount Lakia, rears its summit to 3,500 feet above sea level. The wild and romantic character of the scenery of Misima leaves an indelible impression upon any traveller who sets foot on the island, and can scarcely be rivalled in any part of this portion of New Guinea. A fringe of raised coral reef exists around the east coast of the island, presenting a perpendicular face to the sea. I first set foot on Misima near Bagoiya, where the temporary quarters of the Resident Magistrate of the Louisiade Group were situated, and had an opportunity of examining the coast line in the vicinity of the mouth of Gumonina Creek. Gumonina Creek has a generally southerly direction, and enters the sea somewhere between the villages of Gaibobo and Labbipi. The coast consisted of an almost flat terrace, a little above high water mark. From this rises a white vertical escarpment of about 20 or 30 feet in height, forming another similar terrace. The face of this cliff is weathered into curious cavernous forms. Through this mass of upraised coral reef, Gumonina Creek has cut a channel for itself to the sea. The platform upon which this elevated reef rests consists of vertical crystalline schists, the prevailing strike of which is paralled to the length of the island itself. These schists are intersected by pale-grey granite, and contain numerous quartz reefs, which no doubt is the parent source of the gold for which the island is famed. From Gumonina, the whole of the coast line, as far as the native village of Tenoklamana, was fringed with similar coral limestones, which were observed forming terraces at all elevations above the sea level. No further opportunity of examining the elevated reef masses of the south coast than was afforded by a traverse along the coast from a point near the village of Lagira to Bagorya presented itself. The character of the limestone was the same throughout; no organic remains were noticed; in all probability the structure of the corals may have been obliterated. The north-east coast of Misima, in the vicinity of Treachery Bay, there were several instructive sections which showed the relation subsisting between the elevated reef masses and the underlying rocks. From Sagara, the coast as far as Gulewa Creek was traversed, and for some distance the track skirted the foot of cliffs of white limestone. When approaching Gulewa, bold cliffs of coarse volcanic conglomerate, full of pebbles of acidic lava were encountered; interstratified with these were thin lavas of a distinctly trachytic type. The elevated reef

masses rested upon these volcanic rocks. From Gulewa I waded waist deep up the creek (there being no other way of getting up), until a huge vertical wall of limestone was encountered, the base of which was 100 feet above sea level. From beneath this escarpment the waters of the creek issued with a deafening noise. On scaling the cliff, I found myself on the dip-slope of a bed of limestone, full of gigantic swallow holes; at intervals in the cliffs could be seen the entrances to (as yet unexplored) caverns, from the roofs of which pendant-like masses of carbonate of lime depended. My native guides eventually led me to the edge of a gigantic swallow-hole, at the bottom of which water could be heard flowing. A perilous scramble down the face of the cliff, over 130 feet in height, brought us to the bottom of the hole. The section *en route* showed the coralline limestone resting upon a coarse volcanic conglomerate. At this point the waters of Gulewa Creek emerged from beneath a cliff of volcanic ash capped with limestone, entered a cavern 80 feet high, and disappeared from view with a most unearthly roar. The cavern, about an acre in extent, present a fairy-like appearance, on account of the presence of numerous beautiful stalactites and stalagmites. The stalagmites rested upon a foundation of sand. The limestone of the Gulewa Cave contains numerous corals, the structure of which had not been entirely obliterated by the chemical changes which rock had undergone. I was unable to ascertain, owing to linguistic difficulties consequent upon requiring at least three interpreters, whether the cave visited by an earlier explorer, Mr. Basil H. Thomson, was the one I visited. This gentleman, in his "Narrative of an Exploring Expedition to the Louisiade and D'Entrecasteaux Islands," says:—"The limestone hills which compose the centre of the Island of Misima are honeycombed with caves. Near a spot called by the natives Kaiaba, a stream, after taking its rise from a great wall of limestone, plunged into a great cavern in the opposite cliff. The mouth was a perfect arch, 150 feet from floor to roof. At the far end, the river thundered down into a dark tunnel, through which it passed under the range, emerging into daylight after some three miles of darkness."

Such limestone caverns are common in the other areas of up-raised reefs, viz., the Solomon Islands, the Tongan Group, &c.

The north-east coast has a large development of elevated reef masses. The vicinity of the village of Awaiaama is a conspicuous cliff; Garirura presents to the sea a bold escarpment of white coralline limestone, which rises to altitudes reaching as much as 100 and 120 feet in height.

Leaving Gariruru, the coast was skirted, and after passing Emurimuri Point, the anchor was dropped off the village of Tauputa. A traverse some distance inland exposed horizontally bedded basic lavas, which, at an attitude of about 800 feet above sea level, were over-

laid by white limestone. Alternations of these lavas and coral limestones were observed up to a height of 2,000 feet ; at this point a bed of white coral limestone was encountered, forming a conspicuous cliff called by the natives Korada. From Tauputa, I skirted the coast as far as Agonai ; there was practically no beach, for the land plunged down suddenly into deep water. The coast in this neighbourhood being practically timberless, the bold cliffs afforded splendid opportunities of studying the geology. I could see from the boat several conspicuous limestone escarpments at all attitudes above sea level.

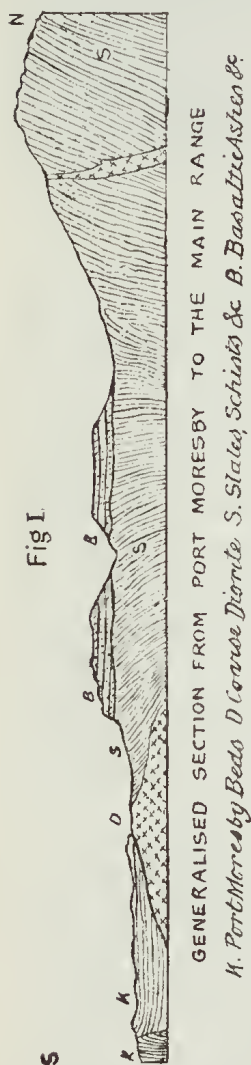
IGNEOUS ROCKS.

Next to the elevated reef masses, the volcanic phenomena of British New Guinea arrest the attention of the observer. With reference to this subject, I cannot refrain from quoting a passage from Macgillivray's "*Voyage of H.M.S. Rattlesnake*," in which it is observed that :—"The fact of the existence of several active volcanoes on islands immediately adjacent to the north-east of New Guinea (first made known by Dampier), and the circumstance of volcanic bands traversing the length of many of the great islands of the Malayan Archipelago and others, as far to the southward as New Caledonia and New Zealand, rendered it extremely probable that we should have found indisputable signs of comparatively recent volcanic action in the south-east part of New Guinea. We saw no volcanoes, however, and the great central mountain chain appeared to me to be probably granite." On a later page, in the second volume, remark is also made of "the total absence of signs of volcanic agency" in the Louisiade Archipelago. Observations, however, showed that both active and extinct craters in addition to other manifestations of volcanic activity do exist all over the Colony, though in localities which, however, could hardly have been examined by Mr. Macgillivray.

My first acquaintance with the volcanic phenomena was made during a traverse from Port Moresby to the Astrolabe Range. This range, which forms a tableland at the foot of the backbone of New Guinea, appears to have been first described by Macgillivray. He says :—"Mount Astrolabe differs in character from any other of the New Guinea mountains seen by us, indicating a different geological formation. The summit extends thirteen miles, running parallel with the coast line, and distant from it about eight miles. Viewed from the south-westward, the outline is irregular, exhibiting a series of nearly flat tops with slight interruptions, but from the southward it appears as a succession of terraces or projecting cliffs, precipitous in front near the summit, with a long, steep slope below, probably the debris, while the flat top slopes backward with a very gentle declivity."†

†Macgillivray, J. *Voyage of H.M.S. "Rattlesnake,"* Vol. II., p. 60.
London, 1852.

From Port Moresby to the foot of the Astrolabe, the staple formation consists of sandstones, shales and limestones, often inclined at



high angles to the horizon. The basement bed of the volcanic rocks was found to rest upon the up-turned edges of reddish shales at an altitude of 2,060 feet above sea level, the lower most member of the series consisted of a fine grained much weathered volcanic ash. From base to summit, this portion of the range consists of nothing but an enormous thickness of coarse volcanic conglomerate. On reaching the edge of the tableland, and proceeding to the village of Tabouri, some miles distant, the track passes over nothing but coarse conglomerate. From the village to Warino Creek, which rises in the range to the south, nothing but sheet upon sheet of horizontal volcanic conglomerate is visible. The pebbles of the conglomerate are subangular, and naturally vary very much in size; in composition they vary but little, and consist for the most part of conglomerate. Between the Warino Junction and the Falls of the Laloki, the river forms a series of picturesque rapids, due to the water falling over the outcrops of some of the irregular bands of fine ash, which are interstratified with the coarser materials. Many fine perpendicular cliffs in the Laloki Cañon give a good idea of the structure of these enormous ash beds. At the Laloki Falls the river, which previously has flowed over the surface of these horizontal beds, suddenly plunges over the perpendicular escarpment, 300 feet in height, and flows down a magnificent cañon for over a mile, after emerging from which it enters the comparatively open country. I climbed, accompanied by three natives, to the verge of the cañon, at a place called Babera by the

guides, in the hope of being able to trace the course of the escarpment northwards, but a Scotch mist effectually prevented my so doing. Looking down the valley from my coign of vantage, a bold scarp, several hundred feet in height—Hombroon Bluff—was seen to form the north-eastern end of the Laloki Cañon. From Tabouri the country to the south-east was traversed; to the divide between the headwaters of the Laloki and the Kemp Welch Rivers, the whole section proved to

be identical with that hitherto seen. From the highest point I ascended in the vicinity of Tabouri, I could see tier above tier of either lava or conglomerate in the hills to the north-east, which I took to be the Richardson Range of the Charts.

This volcanic plateau presents many features in common with those extensive deposits occurring in different portions of the northern portion of the Australian Continent, with which I am familiar. Passing along the coast from Port Moresby to Milne Bay, an excellent opportunity for examining many of the hills, which familiarity with similar types, enabled me to recognise as being undoubted volcanic foci was presented. The small island of Dobu (Goulvain) lying in the straits separating Duan and Moratau in the D'Entrecasteaux Group, is from four to five square miles in area, and exhibits manifestations of volcanic activity. Approaching Dobu from Dawson Straits, the island was seen to possess that graceful contour which distinguishes many volcanic cones, and when viewed from the anchorage off Boduwagui Point, the highest summit seemed to be a truncated cone, having an almost level top, with numerous spurs running down to the beach. The seaward face of the cone is deeply furrowed by wooded ravines. In landing, I walked along the coast to the northward as far as certain points from which steam was seen issuing. The cliff sections showed nothing but brownish stratified sand and gravel, containing subangular pebbles of glassy lava and pumice. Some of the gravel is solidified into sandstone, through which so called "springs" issue below high water mark. My first visit was paid at about the time of high water. There were several orifices extending over an area of about 100 yards, from which water issued at an average temperature of 200 degrees Fahrenheit. The gas, which was given out copiously, had a strong sulphurous odour.

A second visit to the locality at low water showed that the so-called "boiling springs" were merely fissures to which sea water had access. The sides of the fissures were encrusted with deposits of flowers of sulphur. A few yards behind the fumaroles was a whitish grey cliff, exhibiting undoubted evidences of solfataric action. In the caverns in the cliffs, there occur large deposits of yellow and greyish brown sulphur commonly massive, but here and there in the form of acicular crystals. These caverns, many of which I discovered when breaking down the cliffs with my hammer, were found to have a very high temperature.

Near the centre of the south-east end of the island is an extinct crater; what now remains of it is a lofty circular wall, roughly estimated at about 100 feet in height. A lava stream, rising in the crater, has eaten its way through the wall, and enters the sea opposite the island of Mekumara. I scrambled along the crater wall (upon which a few

native villages had been built) for some distance, and was able to obtain a view of another crater to the south, containing a small lagoon within.

From Dobu, I had an opportunity of examining the coastline of Moratau, the largest island of the D'Entrecasteaux Group, from Ebeoa Point to Girigiria, and in crossing the bay the crateriform shape of Diau could be easily seen. Steam could also be seen rising at several points on the land to the north. My first landing place on Moratau was on the beach, protected by a shore reef, between the two points Atawaina and Rawia. The bold headland Atawaina consisted of a finely banded lava, in which small but perfect sandine crystals could be seen by the aid of a lens. The grassy timberless hill which slopes gradually down to the sea at Rawia, is formed of similar rocks to that of Atawaina, and represents the surface of a lava flow.

After procuring a fresh supply of water for the launch at Meku-mara, I steered for the small bay surrounded by a crescent-shaped wall to the north-west of Rawai Point. Its peculiar scythe-shaped form pointed to its being the segment of an ancient crater, and an actual examination confirmed this view. Manifestations of solfataric action were evident on the face of the cliff. I landed on a coral reef which fringed the foot of the cliffs, and found the sea quite hot, owing to the streams of almost boiling water, which flowed down from the hills behind. I ascended the crater wall to the spot from which water vapour could be seen issuing in a long straight column. The crater was formed of andesitic lavas of the prevailing type. The one main vent—there were several minor ones from which steam and gas with a strong sulphurous odour were emitted—was surrounded by a large area of red and yellow clay, resulting from the decomposition of the lavas. There were all gradations from a perfectly unaltered sandine lava to a pure clay.

The morning subsequent to my visit to this place, I chartered a catamaran and landed at a village in a little bay south-east of Diau; having procured native guides with whom I could only converse by signs, I ascended the top of the crater, the summit of which rose to 900 feet above the beach. The ascent was made up a gully carved out of a blackish ash containing fragments of pumice and volcanic glass. From the summit an excellent view of the cone—a tuff cone—and its associations could be obtained; its south-eastern face is hollowed out into numerous ravines, in which occasional sections show stratified ashes. The crater wall has been breached by a lava which has flowed to within a short distance of the beach near Worua Island. This lava has a surface of indescribable roughness, rendering locomotion on its surface somewhat precarious, and amateur boot repairing an imperative necessity. I followed the edge of the lava flow from its

source to its termination, and was enabled to ascertain that its general character was similar throughout. From the summit of the crater, the emanation of vapour water could be seen over a large area of country to the north.

On the mainland of New Guinea on the north-east coast, several large extinct craters were noticed, the most conspicuous being that of Mount Dayman, which reared its summit to over 9,000 feet above the level of the sea. I had an opportunity of obtaining an excellent view of this huge volcano, when on an expedition, endeavouring to reach the summit of Mount Suckling, whose highest point reached over 11,000 feet above the beach at Collingwood Bay. Our progress to the summit was effectually barred at about 8,000 feet by an inaccessible precipice of quartz schist, which we aptly named Disappointment Rock. From this coign of vantage, it could be clearly seen that Mount Dayman, which was separated from us by a low divide, was the remains of a huge volcanic cone. This cone had been breached by a lava, which had flowed downwards to the north-east coast, and the lower portions of which we had traversed at considerably lower altitudes. Part of the crater wall is still extant, and from Disappointment Rock, I could look right into the crater. Some of the Cloudy Bay lavas on the south coast in all probability emanated from the Mount Dayman volcano. The active volcano of Mount Victoria, which could be seen from Disappointment Rock, bore 352 degrees 30 minutes. In the year 1890 the Administrator, in his inspection of the north-east coast of the Possession, viewed this mountain from Keppel Point, and gave an interesting description of it in the following terms:—"This mountain is very steep and rugged, presenting towards the top great masses of bare rock. Its altitude is probably from 3,500 to 4,000 feet. Its sides were scored and marked by brown lines from near the summit to its base; these at first looked as if caused by lava running down the mountain, but the closest inspection could detect no presence of lava, so that it was concluded that the lines had been caused by recent great earth slips. Some of the fishermen occupied near the Sydney Islands spoke of a smart shock of earthquake that had been felt about three weeks before in Collingwood Bay, so well marked that one man was thrown off a camp stool on the ground. A shock was felt on the mainland about the same time as far as Port Moresby. . . . The summit of the mountain was not visible from near Keppel Point on account of a dense cloud which rested upon it, when the tops of Mount Suckling (11,000 feet) and Mount Trafalgar (4,000 feet) were quite unclouded. A column of steam could, however, be seen rising out of a ridge not far from the top of Mount Victoria, and in a few days later we had an opportunity in the early morning of seeing numerous columns of steam rising, some from the very tops of the two

crests of Mount Victoria, others from spots a considerable distance from the highest points, issuing from crevices and hollows all round the two peaks. By 7 or 8 o'clock this steam always formed a dense cumulus over and about the top of the mountain, which looked like a thundercloud, and completely hid it from view. . . . Flame was not at any time seen by us on Mount Victoria, nor could we obtain from the natives any information regarding it."

This district was visited by Captain Moresby and his officers, who, after rounding Cape Nelson before nightfall on 5th of April, 1874, "were very much impressed by the fine picturesque appearance of Mounts Victoria and Trafalgar." They do not appear to have noticed the emanation of either steam or smoke.

At several places, and at different times during our Mount Suckling expedition, volumes of steam and smoke could be seen issuing from both the sides and summit of the mountain, and upon two occasions the clouds, hovering over the summit, were brilliantly illuminated after nightfall. The earth slips described by the Administrator are probably the narrow gullies excavated out of a mass of fragmental volcanic material; such gullies I found to be characteristic of those tuu cones which I examined in the islands of the D'Entrecasteaux Group.

From the previous descriptions, we thus see that the volcanic phenomena of British New Guinea present all phases, its products are scattered over almost the whole length, and in one or two cases, over the whole breadth of the Possession. It may be interesting to note that Vulcan Island (Long. 145 E.) on the north coast of New Guinea was active when Dampier passed in 1700; D'Entrecasteaux found it fuming in 1793; but in D'Urville's time, 1827, it was extinct, and I can find no record of its having made itself felt since that time.

THE SEDIMENTARY FORMATIONS.

If the elevated coral reef masses and the volcanic phenomena of New Guinea are such as to first command the attention of the geological observer further consideration very soon relegates them to a subordinate position.

The various sedimentary rocks of British New Guinea are well developed in many portions of the territory, but with few exceptions they do not appear to have been very much studied, hence their mutual relationships are not as yet fully understood. Like all other scientific work in extensive and partially explored countries, geological enquiry is bound for a long time to result in neither more nor less than a series of unconnected observations, which, as systematic geological surveys proceed, will be co-ordinated, and gradually fill up the blanks

existing. The solution of many important economic questions involved in stratigraphical research, apart from the study of the evolution of this portion of the earth's surface encourages the hope that an early investigation of these sedimentary rocks of Papua will be undertaken by some competent observer.

So far as at present understood, the sedimentary formations of British New Guinea are as follows:—

1. KEVORI GRITS.—*Post Tertiary*, Grits, Sandstones and Conglomerates.
2. PORT MORESBY BEDS.—*Pliocene Tertiary*, Greenish Sandy Shales, Limestones and Siliceous Beds of Port Moresby.
3. BOIORO LIMESTONES of *Undetermined Age*, Greyish Limestones, etc., of Boioro and the Coast.
4. PURARI RIVER BEDS.—*Cretaceous*, Blue Limestones and Green Sandstones of the Purari River.
5. STRICKLAND RIVER SHALES.—*Jurassic* Indurated Calcareous Shales of the Strickland River, an important tributary of the Fly River.
6. TAURI LIMESTONES.—*Devonian* Limestone.
7. METAMORPHIC ROCKS, CRYSTALLINE SCHISTS, ETC.—Age undetermined; *Archaean*?

1. KEVORI GRITS.—In the Kevori District, which is situated to the north-west of Hall's Sound, are a series of sandstones, grits, and conglomerates. The strata consist of fragments of quartz, slate, and volcanic rocks, cemented together by carbonate of lime. Some of the sandstone strata are much more calcareous than others. The strata appear to have suffered but little disturbance since the date of their formation. They dip at a low angle to the north-east; and as they are followed westward, the strata pass into conglomerate, consisting of slate, quartz and volcanic rock, cemented by carbonate of lime.

It is not with any definite intention of correlating similar beds that it is stated strata of an identical physical aspect are known to me at the following places in New Guinea:—Mailu (Toulon Island), the divide between Tauwara (Milne Bay) and Pouro (Mullen's Harbour), and Redcliff, on the north-east coast of the Possession near the German frontier. The Kevori grits yielded no fossils to me, hence the only clue to their age is the fact that they rest upon strata of Pliocene Tertiary Age. It may be noted that the gasteropod, *Neritina Gagates*, was met in the Post Tertiary rocks of the Aird Hills in the Douglas River, and that this species was obtained in the living state by Mr. J. Brazier at the Katau River, in the "Chevert" expedition.

2. PORT MORESBY BEDS.—The Port Moresby Beds occupy a considerable area of country fringing the coast from Caution Bay south-eastward to McFarlane Harbour, and extending inland for about twenty miles up the Kemp-Welch River; they also occur in the main range north of the Purari River, about 130 miles from the sea. The beds in the neighbourhood of Port Moresby consist of sandy limestones (containing *foraminifera*) and fine grained calcareous shales, with thin bands of a buff color. Black and yellow lenticular nodules of flint, with chalcedony are of common occurrence. The beds are generally vertical or inclined at high angles. In Camp Creek, a tributary of the Laloki, the Port Moresby Beds rest directly upon a coarse granite rock.

Similar strata to those of Port Moresby occur in cliffs along the coast as far as Kerepuna, but they yielded me no fossils.

At Delena on the south side of Hall Sound, the bay at the mouth of the Paumotu (St. Joseph), the strata are represented by buff-colored calcareous shales, sandstones, conglomerates, thinly bedded and massive limestones, which yielded fossils. It was in this neighbourhood that fossils were first discovered by D'Albertis and Macleay.

The Macleay collection comprised :—

Echinoidea. *Temnechinus Macleayana*.

Peronella Diagonalis.

Gasteropoda. *Dolium Costatum*.

Voluta Macroperta.

and an internal cast of *Strombus (Gallinula) Campbelli*, a species now living in the Australian seas,

Roro or Yule Island, charted by the H.M.S. "Rattlesnake" in 1849 I visited, and examined the geological sections seen in the cliffs on the South-East coast. A section of this is depicted hereunder :—



"SECTION AT THE SOUTH WEST END OF RORO (YULE ISLAND)
A Calcareous Sandstones B. Raised gravelly Beach
C. Basaltic Lava

(a) consists of a series of fine grained calcareous sandstones dipping at 20 to 30 degrees to the north-east. These beds contain fossils which proved to be too fragmentary for transport. From one bed I was successful in securing a *Pecten*. Interstratified with these beds are coralline limestone ("Coral Rag"). Many contain numerous

fragments of coral, a few pebbles of quartz and of some basic volcanic rock. The two small chains of hills running along the entire length of the island, referred to by D'Albertis, are formed by the outcrop of some of the beds of this series which are better able to resist denudation.

(b) is the remains of a raised gravelly beach, the base of which is 4 or 5 feet above high water mark. The gravel is of a leaden-grey color, and is crowded with fossils, a collection of which I made, but as my native carriers did apparently not appreciate geological specimens, these, along with some other valuable collections, disappeared.

(c) is a basaltic lava seen on the beach; this lava appears to emanate from one of the high hills which stand out prominently between the two escarpments of the sedimentary rocks. I had no other opportunity of examining the structure of the island.

At the village of Delena, on the south side of Hall Sound, I examined a section in the cliffs to the north. A sketch of this is given below:—



SECTION AT DELENA (HALL SOUND)

- | | |
|--|--------------------------------|
| 1 Buffshale, Sandstone & Conglomerate | 2. Fossiliferous Clayshale |
| 3 Thinly bedded Limestones. | 4 Massive Coralline Limestone. |
| F.F. Faults. 1.2.3.4. Port Moresby Beds. | |

In this section—

(1) consists of buff shale, sandstone and conglomerate dipping north-east, separated by a fault (f) from (2) buff-colored clay shales containing fossils. Proceeding northwards along the coast, the beds become almost vertical, and another fault (f) divides them from (3) a mass of thinly bedded limestone with bands of clayey shales.

These limestones yielded the following fossils:—

Gasteropoda.	<i>Conus Turritella.</i>
Lamellibranchiata.	<i>Cardita.</i>
	<i>Marginella.</i> (?)
	<i>Pecten.</i>
	<i>Pectunculus.</i> (?)
	and <i>Venus.</i>

In the upper portion the clay shales predominate; these also yielded a suite of, as yet, unnamed fossils.

(4) At the north end of the section is a massive white coralline limestone, separated by a fault (*f*) from 3. The limestones of Delena are crowded on their weathered surfaces with organic remains, corals being, as a rule, conspicuous by their comparative rarity. This section is of importance, as showing that in post-Pliocene times earth movements of considerable intensity took place, which possibly formed part of that which resulted in the elevation of the lofty range which forms the backbone of New Guinea.

The Maiva District, south-east of Cape Possession, which I had an opportunity of examining, also contains representatives of the Port Moresby Beds. Beneath the Kevori grits a coralline limestone, passing into a fossiliferous marl, emerges. From the appearance and position of the Maiva limestones, I incline to the belief that they are identical with those of Delena.

"The collection of the Queensland Geological Survey has been enriched by the presentation by Mr. E. Edefeldt of specimens of brown or yellow marl from Maiva Village, found at a height of about 200 feet above sea level. The marl has plentifully scattered through it the remains of small shells in the form of internal casts, and a few fragmentary corals."† Among the Maiva collection, species of the corals *Alveopora*, *Leptoria*, *Galaxea* and *Deltocyathus* were recognised. The collection, however, was of "too limited a nature to permit any definite statement to be made as to the age of the beds; but they are either younger Miocene or Pliocene, probably the latter."‡

3. BOIORO LIMESTONES.—The Boioro limestones are best exposed in that headland in Launoka Doudou (Mayri Bay), from which the beds are named. At Boioro, the limestones are of a dull leaden-grey color, and are seamed with veinlets of carbonate of lime; the weathered surfaces present a curious brecciated aspect difficult to describe. The bedding planes, marked by lines of brecciated fragments are inclined to the north-west at angles varying from 30 to 45 degrees. A vertical dyke of dolerite was seen to penetrate the limestones in the precipitous cliffs of Boioro. Eastwards from Boioro, as far as Nobanoka Bay (Port Glasgow), the country was found to be occupied by similar beds of limestone. The Boioro limestones yielded no fossils to me. Similar limestones were found at Rogea (Heath) Island, and on the mainland north of Samari in the vicinity of Waiera Creek. The Rogea limestones are arranged in thin beds in a small synclinal trough. The limestones of the mainland are identical in every way with those of Rogea. In neither place did they yield any organic

†R. Etheridge, Junr., Our Present Knowledge of the Palaeontology of New Guinea. Records Geol. Sur. New South Wales, Vol. I., part 3, pp. 177.

‡Loc. Cit., p. 178.

remains. The limestones of the mainland are penetrated by dykes of dolerite, and sections are visible showing what have every appearance of being interbedded dolerite sheets. From the sections seen at Losoa Doudou (Millport Harbour), it is evident that the Boioro limestones have a thickness of at least 800 feet.

There is no evidence as to the age of the Boioro beds; from their position they appear *prima facie* to lie beneath the Port Moresby beds, and they have a totally different lithological aspect to that presented by the latter. It is possible that the hard leaden-grey Boioro limestones may be of a similar nature to the *Globergerina* limestones of the Solomons and New Caledonia.

4. PURARI RIVER BEDS.—In the year 1893, a series of blue limestones and green (*glauconitic*) sandstones were met with in the Purari River, at 120 miles from the coast, and lying at altitudes reaching up to 3,000 feet.

The Purari River enters the Gulf of Papua by several mouths, in East Longitude $145^{\circ} 13'$ and was traversed by the Administrator in a steam launch to something like 120 miles, and the traverse was continued for four days in a river boat as far as a point called Biroe. From the head of the gulf, the Purari wended generally northwards as far as S. Latitude $7^{\circ} 54'$ where it was joined by an important tributary called the Aure, flowing southwards from the mountains of the interior. The Aure measured from 80 to 100 yards wide, and had a depth from one to two fathoms. From the junction the Purari River trended westward along the foot of a lofty escarpment 3,000 or 4,000 feet in height formed of sandstones. The main range, as seen from Biroe, lay about 15 miles distant, and presented the appearance of great toothed and nearly perpendicular peaks. At Biroe, S. Latitude $6^{\circ} 54'$, about one degree south of the German frontier, the river had not perceptibly diminished in size, but was much broken up by large islands. Below the Aure junction, observations were made as to the dimensions of the Purari; the width at the spot selected was 265 yards, the mean depth 22 feet, and the speed of the current almost 5 miles per hour. Past this spot there flowed 64,624,700,000 gallons of fresh water per day, or in other words, sufficient to supply 43 gallons of water per day to every person of the population of the globe during the year these observations were made. The Purari River thus proves to be the second largest river in the Possession, being more than one-third, and less than one-half, the size of the Fly River, which latter discharges 180,000,000,000 gallons per diem. To put it in a simple form, and to make the significance of these figures more comprehensible, the Fly River discharges fresh water enough to supply twice the population of the globe with 60 gallons per day.

The Purari limestones contained numerous fossils, but only one proved to be in a condition to be recognised, viz., the phragmacone of a *Belemnite*, characteristic of the Cretaceous rocks of Europe and Queensland. This formation was met with between 96 and 120 miles up the river, and at altitudes up to 3,000 feet.

According to the latest observer, Sir William McGregor, a man of true scientific insight, these beds (sandstones) at the east of Naivaia have been thrown into a series of folds. The beds in the range at Naivaia were observed to dip at about 30 degrees to the south-east, or east, whilst at some spots they proved to be practically horizontal.

Several fragments of coal were met with in the muddy sand and shingle of Abukuru Island, which is in the Purari River, about ten miles above its confluence with the Baroi. As the coal, states the Administrator, "was in sharp, clean, crystalline masses in some of the specimens, it does not appear likely that the pieces could have travelled far."†

Twenty-one samples were collected, and of ten a proximate analysis was made by the Government Analyst of Queensland, Mr. J. Brownlie Henderson. The composition is as follows:—

TABLE OF ANALYSES OF PURARI RIVER COAL.

	A	B	C	D	E	F	G	H	I	J	Av'ge
Moisture	15'4	15'8	16'3	17'0	19'1	19'6	19'9	15'8	18'1	18'0	16'5
Volatile Hydrocarbons ..	36'6	39'7	34'9	39'1	36'3	32'7	37'5	38'9	39'1	39'5	37'2
Fixed Carbon	40'3	39'0	42'0	39'9	36'2	43'6	39'7	35'9	37'9	31'7	38'6
Ash	7'7	5'5	6'8	4'0	8'4	4'1	2'9	9'4	6'9	10'8	6'6
	100'0	100'0	100'0	100'0	100'0	100'0	100'0	100'0	100'0	100'0	

Remarking on the quality of the coal, Mr. Henderson says:—"The composition of the coal has probably been altered by long exposure to running water and air, so that it would be impossible to judge accurately of the coal in the seam, from which this was derived. Still, it seems evident from the analyses, which show the samples to come from different parts of the same seam, that the coal will be a good one for heating purposes."†

"The greenish-grey sandstones and the blue limestones very likely belong to one and the same formation. It would appear

† Despatch 2, 1894, par. 7.

†R. L. Jack and W. H. Rands, Reports on Geological Specimens. Appendix B.B. Annual Report, B.N.G., 1893-94, Brisbane. By Authority, 1894, pp. 91-96.

that the formation must attain a thickness of at least 3,000 feet, which, of course, would leave room enough for the intercalation of coal seams. The carbonaceous markings on the sandstones point to a certain amount of plant life, and it is possible that during the period represented by this formation, plants may have accumulated sufficiently to form seams of coal. It is unnecessary to add that the occurrence of a coal-field might exercise a great influence on the future of the Possession."

5. STRICKLAND RIVER SHALES.—The Strickland River is an important tributary of the Fly, which it joins near the eighth parallel of latitude, and was explored in 1885, and was named after the late Sir Edward Strickland, K.C.B., the President of the Society which despatched the expedition.

A series of specimens collected by the Naturalist of the party, Dr. Haacke, at a spot 75 miles above the confluence of the Strickland and the Fly Rivers, among them a series of indurated fossiliferous calcareous shales. These Mr. Robert Etheridge, Junior, examined and recognised the following ammonites :—

Stephanoceras, allied to *S. lamellosus*.

„ „ „ *blagdeni*.

„ „ „ *calloviensis*.

and an ammonite allied to *Ammonites lingulatus*.

These observations demonstrate the occurrence of strata somewhere in the watershed of the Strickland, which correspond homotaxially with strata of Oolitic Age, and possibly on the horizon of the Upper Oolites.

6. TAURI LIMESTONES.—In 1893, at a spot on the Tauri River lying to the east of the Purari, and 29 miles from the coast, the Administrator collected a fossiliferous limestone, in which the coral *Heliolites porosa* was detected. This observation indicates the occurrence of beds of Devonian Age in the locality. Unfortunately no further particulars as to these beds are obtainable.

7. METAMORPHIC ROCKS, CRYSTALLINE SCHISTS, ETC.—The metamorphic rocks and crystalline schists, which are presumed to be of Archaean Age, form the axis of the mountain chain of New Guinea, and are continuous through the islands of the D'Entrecasteaux and the Louisiade Groups. An immense area, extending for a few miles back from Port Moresby, nearly to the eighth parallel of south latitude (the German frontier), is occupied by these crystalline and metamorphic rocks. Another large area occurs on the mainland to the east at Mount Suckling. The greater part of the intervening district, and, indeed, probably the greater part of the highland interior of the Posses-

sion may be conjectured to be of similar constitution. The rocks can be broadly separated into two totally distinct divisions; the first includes what may be called the crystalline schists; and the second all those other rocks in which the transmutation has not gone on sufficiently far to conceal their derivative nature. Since no fossiliferous beds are known of earlier date than Devonian, it is evident that the age of these crystalline and schistose rocks is, at the best, very uncertain. These metamorphic rocks and crystalline schists are of considerable economic importance, in that they form the original matrices of those deposits which have yielded the quarter of a million pounds worth of gold, officially recorded from the Possession.

GOLD IN NEW GUINEA.

The list of minerals of economic importance hitherto met with in British New Guinea is small; considering, however, the enormous area of, as yet unexplored, country and the comparatively small number of persons who have hitherto made the search for minerals the object of their visit, and the fact that the natives of the country do not make use of the more important minerals, this scarcely excite no surprise. A fair quantity of gold, as may be seen by the table attached, has been obtained from the Possession, mainly, however, from alluvial deposits.

TABLE SHOWING THE YIELD OF GOLD FROM BRITISH NEW GUINEA.

YEAR	YIELD OF GOLD.	VALUE OF GOLD.
(Financial)	Ozs.	£
1888-9	3,850	14,387
1889-90	3,470	12,440
1890-91	2,426	8,371
1891-92	1,235	4,322
1892-93	582	2,236
1893-94	1,128	3,906
1894-95	728	2,565
1895-96	1,373	4,735
1896-97	7,148	25,018
1897-98	6,830	25,612
1898-99	12,012	44,185
1899-00	9,256	32,478
1900-01	9,188	32,646
1901-02	11,881	42,214
1902-03	Not Available	
1903-04	Not Available	
TOTAL	31,107	230,728

The earliest record of the discovery of gold in British New Guinea is that contained in Vol. II., p. 69, of Mr. John MacGillivray's work, "Narrative of the Voyage of H.M.S. Rattlesnake," published in 1852. The author says:—"That gold exists in the western and northern portion of New Guinea has long been known; that it exists also on the south-eastern shores of that great island is equally true, as a specimen of pottery procured at Redscar Bay contained a few laminar grains of this precious metal. The clay in which the gold is imbedded was probably part of the great alluvial deposit on the banks of the rivers, the mouths of which we saw in that neighbourhood, doubtless originating in the high mountains behind part of the Owen Stanley Range."

The next reference, 24 years later, is that contained in a letter sent to "The Times" newspaper by Captain Moresby, on his return to England from a surveying cruise in "H.M.S. Basilisk." This letter, republished as an appendix to Moresby's "Discoveries and Surveys in New Guinea," bears no date, and beyond the bare statement that some of the ship's company found "auriferous quartz in Fairfax Harbour, Port Moresby," no details are given. Writing in 1882, Mr. A. C. Locke†, as to this find, says that some of the crew of the "Basilisk" picked up a piece of auriferous quartz from the bed of a stream in Moresby Island flowing into Pitt Bay, but a second could not be found."

The year after Captain Moresby's letter was made public, it was announced that gold had been discovered by the Rev. W. G. Lawes, of the New Guinea Mission on the Laloki River, at no very great distance from Port Moresby, and by a party working under the direction of the late Mr. Andrew Goldie (a well-known trader), on a tributary of the Laloki, which now bears his name. The specimens passed through the hands of the late Mr. C. S. Wilkinson, Government Geologist of New South Wales. The announcement of the discovery by Messrs. Lawes and Goldie, Mr. Wilkinson stated, was confirmation of the conclusion to which arrived from "an examination of the rock specimens already obtained from New Guinea by the Hon. W. Macleay, M.L.C., during his voyage of exploration in the "Chevert," and by Mr. D'Albertis on the Fly River." Mr. Wilkinson, however, stated that the prediction of the possibility of auriferous deposits occurring in the Colony was not made public from humane motives.

The first party organised for purely prospecting purposes was that which left Australia in the spring of the year 1898 in the "Colonist." The members of this party examined the country drained by the

†A. C. Locke. Gold: Its Occurrence and Extraction. London, 1882, p. 479.

Laloki and the Goldie, but do not appear to have met with any very encouraging results, for it is stated that "the total distance traversed by the party during their three prospecting trips was 370 miles, and throughout the whole of that distance not a grain of gold was discovered."† The late Mr. Richard Daintree, formerly Government Geologist of Northern Queensland, writing in 1870 on the metamorphic rocks of that State, and the occurrence of gold in New Guinea remarked :—"It would seem, therefore, that the rock formation of the three largest northern diggings, the Peak Downs, and a portion of the Gilbert, is largely represented at the south-eastern extremity of New Guinea, with an authenticated trend and strike which, if continuous, would give such rocks a large development in the interior, and so afford a fair promise of goldfields when colonised."*

Results have shewn that Daintrees' prognostication has in some measure been fulfilled.

† Nature, Vol. xix., 1878, p. 15.

* R. Daintree, General Report on the Northern Districts of Queensland, Brisbane By Authority, 1870, p. 8.



Two New Species of Orchideæ from Western Australia.

By CECIL R. P. ANDREWS, M.A.

PTEROSTYLIS SARGENTI, sp. nov.—

Radical leaves withered before flowering, and not seen. Scape 1-2 flowered, 3-5 inches high. Leaves or empty bracts lanceolate, $\frac{3}{4}$ -1 $\frac{1}{4}$ inch long, clasping the stem with rounded auricles, the lowest one or two reduced to sheathing scales. Galea about $\frac{1}{2}$ in. long, curved forward; dorsal sepal ending in a short up turned point 1-2 lines long; lateral petals very shortly pointed, their junction with the dorsal sepal marked by lines of white hairs inside the galea. Lower lip $\frac{1}{2}$ inch long, pointing downwards, the entire part as long as the lobes, which end in filiform points about 2 lines long and are separated by an acute sinus. Labellum on a broad claw, glabrous, 3-lobed; the middle lobe triangular, about 2 lines long, with a ridge down the middle; lateral lobes 1 $\frac{1}{2}$ lines long, linear-lanceolate, slightly curved, produced at the base into erect thick clavate dark-brown appendages fully 2 lines long and recurved at the top. Column nearly as long as the galea, with short, almost orbicular, wings on either side of the rostellum; the wings with a very short point at the upper outer angle. Anther short, not acuminate.

The specimens were sent to me by Mr. Alex. Purdie, who received them from Mr. O. H. Sargent, of York. Mr. Sargent found them flowering in July and August, 1904, within a few miles of York.

The species belongs to the section *Calochilus*, and in habit and general appearance, is not unlike small specimens of *P. longifolia*, R. Br., though the curve of the galea is different and the lower lip is more like that of *P. rufa*, R. Br. The labellum and its appendages are quite distinct from those of any other species, and the column wings have no lower lobe. I have not seen the lines of hairs inside the galea in any other species.

THELYMITRA PSAMMOPHILA, sp. nov.—

Stem 5-8 inches high, slightly flexuose. Leaf narrow-linear, 1 $\frac{1}{2}$ -3 inches long; empty bracts 2 or 3, leaflike, but only $\frac{1}{2}$ inch long. Flowers 2 to 4. Sepals and petals ovate, more or less acuminate, 3 to 5 lines long, yellow. Column-wing continued behind, but shorter

than, the anther, with a broad rounded middle-lobe, and narrow triangular lateral lobes, dark reddish-brown in color. Anther-connective produced slightly beyond the cells, broad and obtuse.

I found this species in flower on sand plains near the Upper Kalgan River and Stirling Range in October, 1903.

In appearance, this plant is very much like *T. antennifera*, Hook. f., though the stem is less distinctly flexuose, and the flowers lack the red coloring on the outside of the sepals, which is generally characteristic of the latter species. The sepals and petals are broader in proportion to their length than those of *T. antennifera*. The column wing places the new species in the section *Macdonaldia*, but is quite unlike that of either of the two species (*T. carnea*, R. Br. and *T. flexuosa*, Endl.) previously included in this section.



